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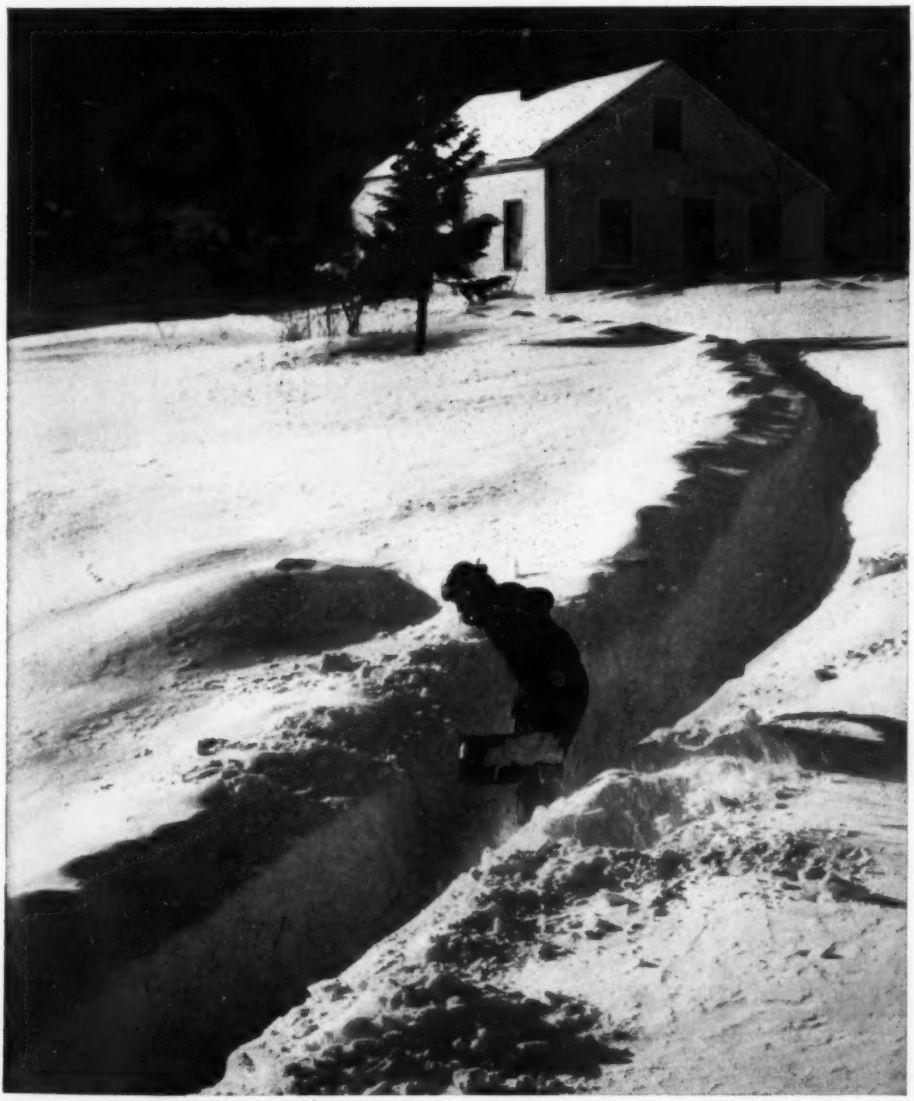

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Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXV NO. 1

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Let's Keep Our . . .

Pledge to Youth

Jeff McDermid

THIS is the best of times and the worst of times, but certainly no time to forget the duties and privileges of seeing youth grow and expand, and being as considerate of their welfare as the hope of the world demands. And you can't buy it with appropriations. New Years is a threshold across which youth looks to a better day, even when visibility is "ceiling zero." Some of us elder gentry whose active parenthood responsibility is past (or who were never blessed with offspring) tend to lose ourselves in vain regrets and backward glances, and pay too little heed to the needs of the hour.

But when our grown-up children refer to some almost forgotten incident or household shrine or treasure of the past, as they remember "when we were little," it tugs mightily at your heart and revives once more the days of mixed delight and dilemma, and of great responsibility and family cheer. For you can relax a bit at that and feel glowing and grateful over having been able to provide a few of those endearing moments that now combine with their own adult realities to produce the God-fearing, upright kind of citizens our children have become.

It brings it all back with most of the worries left out and none of the old doubts and fears to plague us. No longer do we cringe and dodge to escape imaginary thrusts of fate or fret about that none-too-profitable job lest some of those real and fancied opportunities of America will be denied to those we cherish. We should not

spend our declining period in vain regrets about the deeds we should have done to make our family name shine brighter for awhile, or mourn because we have not been as influential and forceful as we set out to be before the babies came, or when depression and war curbs cramped our courage.

Our kids do not seem to mind that noticeable lack of either fame or fortune in the least. They won't have too much "to live up to" in that way anyhow. They are comforted by their memories, just as we are. They are pleased no end by those things which they mutually enjoyed "when they were little."

AS we look about us now and see happy children on the road to school, busy playing hop-scotch, dressing dolls, or wearing all the accoutrements of two-gun Cassidy, it seems to mean that children are singularly blessed by indifference or ignorance of the selfish world of maturity. Of course, they probably do not entirely escape the facts of life and may be aware that all is not normal and hopeful in the soil wherein their roots are set.

Whatever they realize, their actions do not reveal anything but the usual carefree and trustful attitude which generations of our privileged youth have learned to adopt. On our part, we are aware that many promises cannot be kept with certainty during a period of grave unrest, yet this does not mean obliteration of old landmarks or uprooting of old goals that time has proved worthwhile.

Late in 1950 at the White House Conference on Children and Youth, some basic truths were woven into a series of pledges. Too few people took time to read them under the tensions of the tragic upheaval.

These may well be reviewed and pondered upon. The first two items were:

"From early infancy, we gave you our love, so that you might grow with trust in yourself and others . . . We will recognize your worth as a person and we will help you to strengthen your sense of belonging."

Next comes this one: "We will respect your right to be yourself and help you to understand the rights of others, so that you may experience cooperative living." This is so closely related to another point in the pledge that they belong together—namely, "We will illustrate by precept and example the value of integrity and the importance of moral courage."

Few of us with parental experience can overlook times when we slipped badly in this regard. Sins of harshness, anger, and the opposite evil—pampering—all work against training a youth to respect the rights of others and exhibit moral courage and personal integrity.

Short tempers and impetuous actions never become parents any more than they produce good state and federal leaders. When Dad breaks into an uproar and lets loose with tantrums, his kids lose some respect for his self-control and too often grow moody and selfish under such experiences.

At the other extreme we doting parents may magnify beyond all reason the position and privilege of the child in society. Every time we try to build super-defenses around the daily contacts of our kids as though they were deserving of much more consideration and protection than other folks, we breed draft-dodgers and slinks.

Then there's that old excuse for not using discipline that one of my neighbors practiced much to our disgust. His youngsters enjoyed no end playing wicked tricks on associates, and indulged in such playful adventures as breaking milk bottles on garage driveways to see the tires pop. When we mildly protested such banditry, he leaned over the fence and grinned in explaining, "Oh, in our house we have quit all those negative methods of dealing with childish growth and development. We are strong for the positive approach. So we never tell them *not* to do anything. Instead we put the

emphasis always on *do* this or *do* that. It's the only sound way to make children use good judgment and work out their own destinies."

So I felt like telling his rebel boys to please come on over in front of their own garage and bust up some bottles for a change. It wouldn't do to forbid them in a negative way. You had to prove to them first that their

way was not conducive to genuine community welfare. (We are having similar difficulty dealing with certain nations on that basis now.)

Next on the agenda: "We will help you develop initiative and imagination so that you may have the chance freely to create; and we will encourage your curiosity and your pride in workmanship, so that you have the satisfaction that comes with achievement."

Not all fathers and mothers possess the skill or love of craftsmanship or the ingenuity needed to create or design, but there is usually some gifted and willing person in the community whose talent extends to the teaching field. One of my neighbors was himself a married man minus children, but he saw the craving of the lads in our suburb for manual arts outside of routine school work. So he devoted two nights each week in a nook over his garage to the inspiration and guidance of those eager fellows. When he was taken ill subsequently, his pupils mowed his lawn and shoveled his snowdrifts in a manly acknowledgment of the tutelage he had provided at the bench and forge. We didn't have to remind them to do that either.

Happy is the parent who can put zest and purpose into the doing of some handicraft and share its progress with the rising generation. To work nimbly with the hands and mind wards off mischief and provides an outlet of great value as an antidote to loneliness, worry, and frustration. It's one way to keep step with the marvels and the mechanisms which few alert young people fail to admire and emulate.

THEN comes this one: "We will provide the conditions for wholesome play that will add to your learning, to your social experience, and your happiness."

It's fine to have a "rec room" built into the premises to take care of those idle moments at home or to please and attract the best kind of "company" for the children. But too often parents measure the worth of the playtime facilities by what they cost or how modern they may be. This recalls the memory of a rugged old neighbor of ours away back at the turn of the century. Poor himself and unable to grant the meager indulgences of the times to the boys and girls of the township, he drew upon his own pioneer childhood for primitive pleasures in the open air.

One winter he took us all out to the thickly iced pond and helped us cut two large limbs from a locust tree on its frozen shore. One he showed us how to drive down and anchor below the ice, using the other lighter limb for a crosspiece fastened to the upright vertical pole so that it would swing and revolve in circular fashion. A sled was then attached front and rear to the

(*Turn to page* 48)

Fig. 1. Preparing soil samples for analyses.

Soil-testing Reduces Guesswork

By W. L. Nelson and C. D. Welch

Soil-testing Division, N. C. Department of Agriculture, Raleigh, North Carolina

A LIME and fertilizer recommendation based on a reliable soil test is important in profitable crop production.

Soils vary greatly in fertility levels. Much of this difference is due to past management practices as related to cropping, liming, and fertilization. However, these past practices have varied so greatly from farm to farm that a fertilization and liming program which will do well on one field may be entirely unsatisfactory on another field. Examples of the wide variations in the plant-nutrient levels of soils within a given county are shown in Table I.

TABLE I.—SOILS VARY GREATLY IN FERTILITY WITHIN A GIVEN COUNTY.*

County	No. of soils tested	Percentage of soils at each plant-nutrient level				
		Very low	Low	Medium	High	Very high
				Phosphorus		
Bladen	587	6	14	13	20	47
Buncombe	359	43	26	8	8	15
				Potash		
Bladen	587	19	55	19	4	3
Buncombe	359	3	21	24	13	39

*From a summary of soils tested in North Carolina in the period July 1949 to June 1950.

Evaluation of Soil Fertility

Several approaches have been used in evaluating the fertility levels in soils in order that the proper rate and kinds of lime and fertilizer be applied. These approaches might be listed as follows:

Knowledge of the liming, fertilization, and cropping history. The requirements can be predicted to a certain extent but with a considerable lack of accuracy—first, because it usually is difficult to obtain an accurate history from the farmer, and second, because the losses of plant nutrients due to crop removal, fixation, and leaching are difficult to evaluate.

Observance of deficiency symptoms on growing plants. Plants show symptoms of nutrient deficiency, if the lack is severe enough, and give good leads as to the fertilizer requirements. However, these symptoms are often complicated by disease or insect damage, and absolute identification of deficiencies may be difficult. In most instances, by the time the deficiency occurs, it is too late to obtain full benefit from fertilizer additions to that particular crop. In addition, plants may be mildly deficient and not show characteristic symptoms, yet yields might be increased by proper fertilization.

Tissue tests on fresh plant tissue. The plant is the end product of all the factors in the environment, and much information can be obtained from tests made directly on the growing plants. A notable example is the nitrate test on corn. Of course, as in the case of deficiency symptoms, if the plant is found to be lacking in a given nutrient it usually is too late to obtain maximum benefit from fertilization.

Soil tests. This method permits the soil to help answer the question as to plant-food deficiencies which can be corrected before the crops are planted. It should be kept in mind that soil tests are most effective when used in conjunction with tissue tests, deficiency symptoms, and management history. The coordinated and careful use of these four tools should make for more effective and more efficient use of lime and fertilizer.

It must be remembered that poor crop yields are not always due to plant-food deficiencies. Merely applying the right amount of lime and fertilizer will not insure getting a good crop yield. Careful attention must be given to good varieties, proper cultural practices, correct seeding date, and control of weeds, insects, and diseases if maximum benefits are to be realized from the lime and fertilizer applied.

Soil-testing Service in North Carolina

The service is carried on by the Soil-testing Division of the North Carolina State Department of Agriculture (Fig. 1). No charge is made for testing. As in many other states, the demand for soil tests is growing rapidly and in North Carolina the number of samples tested has doubled in the last two years (Fig. 2).

Soil sample containers, mailing cartons, and information sheets are furnished by the Soil-testing Division and are distributed in the county by the

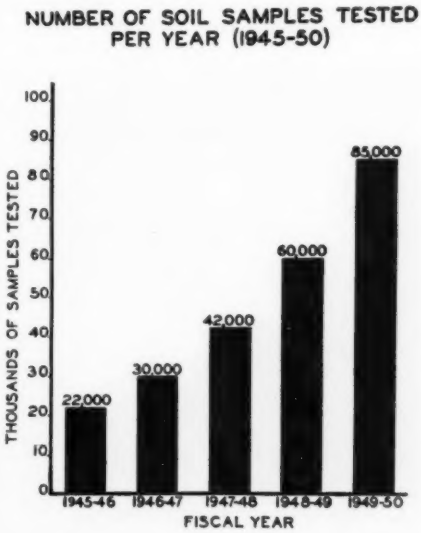

Fig. 2. The demand for soil testing is increasing rapidly and the number of soil samples tested in North Carolina has doubled in the last two years.

county farm agent, vocational teachers, Soil Conservation office, or P.M.A. office. The analyses and recommendations are made in a central laboratory at Raleigh. The original report goes to the farmer and a copy to the county agent, plus any other designated individuals.

Importance of Good Samples

Continual emphasis must be placed on the importance of good samples (Fig. 3). It is essential that the sample represent the field, as recommendations based on a poor sample may actually be misleading rather than helpful. In fields where yearly applications of complete fertilizers are made, the fertilizer from the previous year may be incompletely mixed with the soil. The same problem of incomplete mixing exists on fields limed within the last 3 or 4 years. Therefore, it is very important that the topsoil sample be composed of soil taken from at least 15 to 20 spots over each field.

In the North Carolina program, full instructions for taking the samples and for filling out the information sheets are given on the soil sample containers and on the information sheets. The county agricultural leaders are informed as to the necessity of following the instructions, and in turn these leaders teach the farmers.

Time of Taking Samples

One problem connected in part with sampling is related to the seasonal distribution of samples. In North Carolina one-half of the soil samples are sent in during the months of January, February, and March (Fig. 4). At this time, the North Carolina farmers are busy making plans for liming and fertilizing their spring crops. While the farmers are being encouraged to send in their soil samples well in advance of planting, this large number of samples in January, February, and March is to be expected. The extra load at this time is taken care of by increasing the laboratory and office staff by about 50 per cent through the use of temporary workers.

Soil testing should be considered on a long-time basis as the supplies of lime, phosphorus, and potash in the soil do not change rapidly. For example, if a soil is low in potash, high-potash fertilizers should be applied to the crops in that field for 4 or 5 years. At the end

Fig. 3. Good samples are essential and the instructions must be followed.

of that time, the soil should be tested again. Testing as often as this is enough to keep the lime in the soil at the proper level and to determine if the fertilization program is adequate for the crop rotation.

Determinations

If the soil tests are to be really used as a basis for recommendations, it is important to make the readings as quantitative as possible. This is desirable from the standpoint of accuracy of the lime and fertilizer recommendations and from the standpoint of the morale of the laboratory workers.

In the North Carolina laboratory, pH, lime requirement,* calcium, phosphorus, potassium, and organic matter are determined on all samples. The pH and lime requirement are obtained on the glass electrode, calcium and phosphorus on the photelometer, potassium on the flame photometer, and organic matter by titration.

Since soil testing on a service basis means handling relatively large numbers of samples, labor-saving equipment and devices are extremely valuable. Many laboratories are using such special equipment with greatly increased efficiency but yet are not sacrificing accuracy.

Uses of Soil Tests

Lime requirement. Soils vary greatly in acidity as well as in texture and organic matter content. These factors affect the amount of lime needed, and a soil test is the best guide in determining whether or not lime is needed, and if so how much. North Carolina farmers are using only a fraction of the amount of lime needed, and even some of this is used unwisely. Soil tests are very helpful in pointing out where the lime would be most beneficial.

Fertilizer requirement. The recommendations of the Experiment Station and Extension Service are of necessity based on average soil conditions, and in many instances ranges in grade of fertilizer and in rate of application are given. Since soils vary greatly in fertility level, each field must be considered a separate problem. Soil analyses help the farmer choose the proper grade and rate of fertilizer so as to correct for low levels of either phosphorus or potash in the soil.

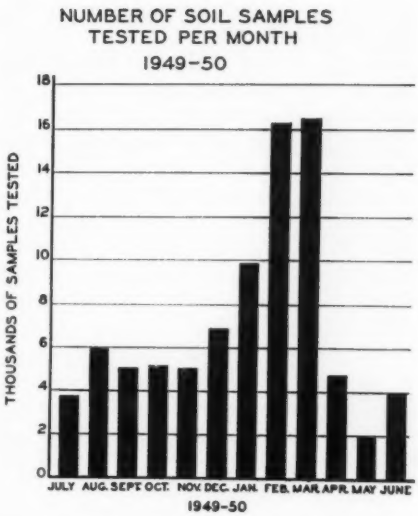

Fig. 4. The seasonal nature of the demand for soil tests is well illustrated by the number of samples tested monthly. In North Carolina, approximately one-half of the samples are received in the three-month period, January, February, and March.

The determination of the amount of organic matter in the soil is very important in the fertilization of certain crops. When organic matter decomposes, it releases nitrogen. With crops such as tobacco, which is adversely affected by too much nitrogen, the amount of nitrogen required in the fertilizer is greatly affected by the organic matter content of the soil.

Following up Recommendations

It is essential that the local agricultural leaders talk over the recommendations with the farmer. This is important, first, so that the farmers will understand the recommendations; second, to encourage the farmer to put the recommendations into practice; and third, because the leaders may have

*Modification of technique described by Woodruff—Soil Science. 66:53-64. 1948.

additional helpful information on the farmer's problem.

In connection with a study of the use of the recommendations based on soil tests, a postcard survey was conducted in North Carolina using questions which could be answered by "yes" or "no." One hundred farmers were selected at random in each of 15 counties. While recognizing the limitations of such a survey, a summary of the 614 cards received revealed the following encouraging information:

91 per cent applied the quantity of fertilizer recommended.

86 per cent applied the grade of fertilizer recommended. Only 9 per cent could not obtain the grade of fertilizer recommended.

83 per cent applied the rate of lime recommended.

77 per cent obtained a good crop yield. Of those not obtaining a good yield, only 1.3 per cent thought it was due to the recommendations.

93 per cent expected to have more soil samples tested.

An important phase of the follow-up work is related to the observations on growing crops where recommendations have been made. Observations of deficiency symptoms and the use of tissue tests can be of considerable assistance in obtaining further information and improving recommendations.

Calibrated Soil Tests Important

The recommendations based on a soil test will be no better than the calibration of the test. The calibration can be carried out only by the analysis of soils where the crop response is known. This can usually be done in conjunction with existing field experiments conducted by Experiment Station workers. These workers should be anxious for such cooperative work, as it provides a basis for projecting their fertility results to other areas. Studies of this nature carried on for a few years will provide a substantial basis for recommendations. Such cooperation insures that the recommendations based on soil tests will be in agreement with Experiment Station results. Standard samples accumulated from these experiments are also invaluable in developing new methods.

Cooperation of Agricultural Agencies

In addition to the Extension Service and the Experiment Station, the cooperation of those agricultural agencies such as vocational agriculture departments, Soil Conservation Service, and P.M.A. is important in carrying out a soil-testing program.

These groups have given splendid cooperation in North Carolina by stressing certain phases of the soil-testing program in their news releases. The vocational teachers are teaching their students, both in veterans' and in high school classes, how to take soil samples. In most counties the Soil Conservation Service is inserting the results of the soil tests and the recommendations in the farm plan. Recently P.M.A. distributed 4,700 copies of a circular on soil testing, one copy to each of the county committeemen. These agencies can be a great help in pointing up the value of soil tests in the effective use of lime and fertilizer.

The fertilizer industry can be and in many cases is being of tremendous assistance in the state soil-testing programs. The industry agronomists, salesmen, and dealers can encourage their customers to have their soils tested and then the dealers can make it a point to stock the recommended fertilizers. Some fertilizer companies have agronomists whose main work is to stress soil testing with the dealers and assist farmers in taking samples. These samples are sent to the state soil-testing laboratory for analysis and the results and recommendations are sent directly to the farmer.

It should be kept in mind that the main objective of all agencies cooperating in the soil-testing program is to reduce the guesswork in lime and fertilization practices and make for a more profitable agriculture.

Fig. 1. Members of a New England pasture tour stop to inspect a fine field of alfalfa on the Bahler Brothers' farm near Ellington, Connecticut.

ALFALFA, Queen of Forage Crops

By B. A. Brown

Department of Agronomy, University of Connecticut, Storrs, Connecticut

WHEN the land is seared by hot, dry winds and even the trees are brown with dust, what more appealing picture meets the eye than a verdant, green field of luxuriant alfalfa? Apparently drawing its food and drink from another unscorched world, this marvelous deep-rooted forage plant flourishes while all others wilt and die, or at best, await better days in a dormant state. No wonder men have long sought to solve the secrets and ways of improving the life of this Queen of Crops.

Since Colonial days New Englanders, faced with many unfavorable conditions for growing crops, have sought kinds of plants which would produce large yields of nutritious food on infertile soils and in a wintry climate. In this search, they have been unsuccessful; but success, at a price, has attended efforts to make the soil a satisfactory medium for desirable crops. Alfalfa is a good example of this statement.

The fabulous reputation of alfalfa to produce high yields of very nutritious forage in the western states soon stimulated attempts to grow it in this region. At the Storrs Experiment Station some work was done with alfalfa before the turn of the century. In that Station's report for 1902-03, it is stated alfalfa had not been generally successful in Connecticut but that in 1902, seed had been sent to some 80 farmers for trial with the object of learning what soil and other conditions were best suited for its growth. According to the report of 1904, very little success attended those farm trials, but alfalfa should not be ruled out until further tests had been made.

The more recent period and the one

with which the writer is familiar dates from 1914. In that year, former Agronomist W. L. Slate divided two-thirds of an acre on the old experimental field near the campus into 26 plots, each of which received a different fertilizer treatment. The purpose of that experiment was, of course, to learn how much lime, phosphoric acid, potash, and nitrogen from fertilizers or manure would be required to grow alfalfa well on the naturally acid, infertile Connecticut soils.

During the 30 years it was continued, that modest experiment yielded some important results. For example, it was learned during the first few years that alfalfa would not live long without additional potash from fertilizers or manure; that if the acidity of the top few inches of soil was counteracted with lime, the alfalfa thrived and extended its roots deep into the still acid sub-soil; that response was obtained from only moderate amounts of phosphoric acid; and that the growth of this legume, like many others, was little influenced by applying carriers of nitrogen. Since those early years, many experiments and experiences have corroborated those initial findings. Before leaving that experiment, however, it should be mentioned that some 20 years after the heavy and only liming (8 to 10 tons per acre of ground limestone) in the plow layer on some of those plots, the acidity of the sub-soil had been reduced to a depth of 36 inches. And without further liming, alfalfa continued to thrive for over a quarter of a century!

In more recent experiments, several other important soil fertility factors have been unearthed. Again, the first concerns potash and particularly the rate and frequency of application. Until about 10 years ago, it was customary to add certain amounts of fertilizers before seeding and expect alfalfa to grow through many seasons without further treatments. With lime and superphosphate, that practice was usually satisfactory; with potash, it wasn't. The reason for the difference is that plants absorb much more potash than they need when large available amounts of that nutrient are present in the soil. Thus, the first few crops of alfalfa after seeding get too much; the later ones too little potash. Without at least a moderate supply of potash, alfalfa soon dies. Therefore, it is now considered desirable in most cases to add potash at least once a year. It has not been very important whether the potash was added once, twice, or three times each season or supplied by fertilizers or manure. Now the general recommendation is to apply each year either 200 pounds of 60 per cent muriate of potash or 12 tons of well-preserved stable manure.

Boron Deficiency

Another milestone was reached in 1939, when it was clearly demonstrated on the experimental plots that most of the mysterious and widespread yellowing of alfalfa during dry periods was due to a deficiency of boron. Boron is one of the so-called "minor elements" necessary in small amounts for all plants. A ton of alfalfa hay contains about an ounce of boron or, in other words, 30 pounds of boron in a million pounds of hay. Although many experiments have shown that applications of borax, which contains approximately 11 per cent boron, have not increased greatly the longevity or yields of alfalfa in Connecticut, it seems advisable to prevent the yellowing and thereby improve both the feeding value of the hay and the morale of the farmers by adding 20 to 30 pounds of borax per acre once every four or five years. Borax is soon effective when either mixed with the soil or topdressed on the surface. Moreover, very heavy applications of lime have not been detrimental to alfalfa when accompanied by additions of borax.

On Charlton fine sandy loam soil, a common type on dairy farms, additions of the other minor elements—manganese, copper, zinc, and molybdenum

—have had no effects on the stands or yields of alfalfa.

Almost from the beginning, lime has been considered a necessity for alfalfa on our acid soils. Nevertheless, continued experimentation has brought to light new facts pertaining to this old subject. Of the greatest importance, perhaps, is that lime is most efficient for legume seedings when mixed with only the surface two or three inches of soil. A large part of plowed-under lime is positionally unavailable during the vital first few weeks of the young seedling's life. As mentioned earlier, lime gradually moves downward in the soils of this humid region and therefore one need worry little about the acidity of the subsoil if the top few inches are well limed. In general, three or four tons of ground limestone per acre are advisable for alfalfa on previously unlimed soils of the State. After the initial application, one ton per acre every four or five years will usually maintain the proper reaction.

Time of Mowing Important

Alfalfa grows so rapidly for a few weeks after each harvest that one gets the impression its store of nutrients and ability to flourish are inexhaustible. Such is not the case. Regardless of how well fertilized, alfalfa will die if mowed a few times when too immature. For example, two years of two "bud" stage cuttings annually reduced the stand to 27 per cent, while adjacent plots mowed when in full bloom had 71 per cent stands. The reason for such results is that during the first few weeks after cutting, the new growth of alfalfa is made largely at the expense of the nutrient reserves stored in its roots. If continually mowed when very young, those root reserves are never replenished. Many analyses of roots from alfalfa cut at various ages showed that the reserves were reduced to their lowest level about 20 days after removal of the tops. From this lowest point, the roots gradually became better fortified until a peak in reserves was reached when the tops had been growing for some 60 days. But, the first and second cutting hay from a 60-day-old growth has such coarse stems and such a small proportion of leaves that it makes poor feed.

It was found, also, that alfalfa will remain satisfactorily vigorous if the first and second cuttings are made after 45 days of growth. In Connecticut, this usually dates the mowings in mid-June and late July.

Most rules have to be broken occasionally and usually the "45-day" rule should not be followed for the third cutting. This exception arises because 45 days from late July is mid-September and if mowed then, the tops will grow 20 to 30 days afterwards, or long enough to reduce the root reserves to a very low level just at the time when further growth of tops and, of course, strengthening of the roots are stopped by cold weather. With low root reserves, many alfalfa plants will not survive, especially during the long winter months. The practical solution of

Fig. 2. When alfalfa cannot get enough potash, white spots appear on the leaves, at first around the edges and then over the entire surface. Later the leaves turn yellow and die.

this problem is to postpone the third cutting (or grazing) until mid-October, after which there will be little new growth to weaken the roots.

Variety testing was one of the first alfalfa activities at Storrs and is still being continued. In the early years, particular attention was paid to winter hardiness and gross yields; more recently, resistance to disease and feeding quality have been recognized as important factors.

Some 15 years ago, farmers who had grown alfalfa for many years found they could not maintain their stands nearly so long as when the crop was new to their land. In 1941, while seeking the causes of such failures, a new variety test was started at Storrs on land which had grown alfalfa for many previous years. Among the 12 strains in that test were two unnamed ones, A-11 and A-136. The former was bred in Kansas, the latter in Nebraska. During 1942 and 1943, A-11 and A-136 appeared no better than most of the others. But in 1944, and especially in 1945, marked differences in stands became evident. By the end of the 1945 season, the old stand-bys, such as Grimm and Variegated, had only 23 per cent stands while A-11 was first with 93 per cent and A-136 was second with 79 per cent. The reason for these striking differences is that Grimm and Variegated are not resistant to a serious soil-born disease—bacterial wilt—while A-11 and A-136 are little affected by that trouble. Because of their resistance to wilt, these unnamed varieties not only excelled the others in longevity but also had the highest total yields for the four harvest years.

Between 1941 and 1945, the numbered varieties were named. Now they are known as "Buffalo" and "Ranger." Further tests have supported the earlier results and either variety is recommended for fields where alfalfa has been grown before and one desires to maintain the stands for three or more years. Buffalo is preferable to Ranger, partly because of less infection with "leaf spot," a defoliating disease prevalent in humid mid-summer weather, and also because it has maintained better stands in the Storrs tests.

A few other promising varieties may be heard from later. "Narragansett" of Rhode Island origin and "Atlantic" from New Jersey are among them. It is probable these varieties are not as resistant to wilt as Buffalo and Ranger.

The most vigorous and highest yielding alfalfa during the 1947-1950 period is a variety developed at an experiment station in France. Its stems are very coarse, however, and its resistance to wilt has not been determined.

A few "creeping" varieties of alfalfa are now under test. They will be exposed to frequent cuttings to learn if they will stand grazing better than the ordinary kind.

Pure or Mixed Seedings?

Most of the Storrs experiments have dealt with pure seedings of alfalfa, but some tests of mixtures have been made. As far as yields and quality are concerned, nothing has been gained by diluting alfalfa with either clovers or grasses. During dry seasons, the second cutting yields have been reduced appreciably by having any grasses in the stand. This result traces to the much smaller growth of all grasses than alfalfa during the summer months, especially when those months are drier than usual.

On the other hand, the presence of grasses has reduced the heaving of alfalfa in springs following very cold winters. For this reason, it seems advisable to include some grass in alfalfa seedings on the more poorly drained soils. On very well-drained soils, however, grasses may well be omitted. When grasses are included, the present choice lies between timothy and brome. At Storrs, alfalfa-timothy mixtures have outyielded alfalfa-brome seedings.

Clovers in alfalfa mixtures have reduced the final stands of alfalfa. This is especially true of red clover which

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Soil Properties Influence Fertilizer Needs

By R. E. Stephenson

Soils Department, Oregon State College, Corvallis, Oregon

MOST of western Oregon soils have proved deficient in available nitrogen for any crop that requires much nitrogen for vegetative growth. Some of the soils are deficient in available phosphorus for crops with a high phosphorus requirement. The same condition exists with respect to boron, sulfur, and potassium. But the plant as well as the soil must be considered in specifying deficiencies.

In general, grasses respond to liberal use of nitrogen; the grains respond to phosphorus (on red hill soils); the legumes, to a carrier of sulfur such as landplaster; walnuts, to borax; and the sugar and starchy crops respond to potassium. Such general statements, however, are of little value as a fertilizer recommendation. Any adequate diagnosis must be more specific as to kind, quantity, method, and time of treatment to get results from fertilizing.

Quite commonly, two or more nutrient deficiencies must be corrected before there is satisfactory response to the fertilizer treatments. There are walnuts which fail to produce a harvest from the use of fertilizer until the boron deficiency is corrected, alfalfa that refuses to respond satisfactorily from the use of borax until a sulfur deficiency is corrected, failure of cover crops to respond to phosphorus because of lack of nitrogen, and other similar situations.

As soils become more depleted of humus and available nutrients, the risk of a poor response from the use of one or two elements of fertilizers becomes increasingly great. Extensive greenhouse studies, on many soils, have indicated that when sunflower is used as the indicator plant, nitrogen deficiency is most severe, but that response to nitrogen is greater when phosphorus is used with the nitrogen, still greater when sulfur is included, and greatest when potassium is also included to provide N-P-K-S treatment. But even this combination fails with sunflowers on some boron-deficient soils until borax or boric acid is included in the treatment.

Normally, in Oregon it is safe to guess that for non-legumes nitrogen deficiency will rank first in importance with phosphorus or sulfur next, according to the soil and the crop to be grown. Potassium will come third, except on some soils for some crops where the potassium needs are high. For a few crops on some soils, boron may rank even above nitrogen in importance, so much so that little or no harvest results unless boron is provided. Occasionally, potassium is severely deficient and quite often, for high potassium crops, moderately deficient.

Seller and User

Both the seller and the user of fertilizer should be interested in the crop response; the seller because good results mean more business, and the user because profits are the primary incentive for fertilizer use. Therefore, the right combination and the effective use of fertilizer are of vital importance. Use of fertilizer has proved fabulously profitable at times, and at other times nearly or a complete waste of money, because of improper use, unsuited soil,

or lack of water to make its use effective.

In the use of fertilizer the fact that a soil deficiency may be physical as well as chemical is sometimes overlooked. Most farmers are aware that alfalfa fails in spite of any or all treatments on Dayton silty clay loam, because of heavy, tight claypan 12 to 15 inches thick and 12 to 15 inches below the surface of the soil. This heavy layer may contain more than 50 per cent of clay and is so impervious to roots, water, and air that no deep-rooted crop nor one that is sensitive to poor drainage can thrive, regardless of soil treatment or fertilizer use. A few grasses such as rye-grass or meadow foxtail may be grown quite successfully. Physical limitations are not always as apparent as this, however.

Fertilization of grass, particularly with a nitrogen carrier, gives wonderful responses in increased pasture and seed yields on nearly any Oregon soil. But the right fertilizer must be used and in the right way. On the poorer soil, nitrogen and phosphorus are needed for grass to produce its best. The general recommendation for nitrogen on grass is an early spring application at a liberal rate, or probably still better, a nitrogen application in the fall and again in the spring. But to use the nitrate form of nitrogen early on wet soils such as the Dayton is nearly sure loss, because this type of soil is more or less covered with water in early spring. Nitrate nitrogen is either washed away, leached, or lost by denitrification. The ammonia form of nitrogen should be used if fall application is made, or if the fertilizer is applied early in the spring. The nitrate form can be safely used only after most of the rainy season is over, which is likely to mean a May application.

An unfavorable biological condition in the soil may be mistaken sometimes for nutrient deficiency, as when a legume is poorly inoculated. This may be due only in part to lack of nutrients, or when the soil acquires symphilids which so completely destroy the root system of the crop that satisfactory growth is impossible. Some of the virus troubles so resemble nutrient deficiencies that the most expert cannot distinguish the difference. No nutrient correction has proved a satisfactory remedy for virus troubles. So simple a thing as the selection of the wrong variety for a particular soil and climate may make it impossible to secure satisfactory yields with any fertilizer treatment or management practice. Thus experimental variety tests with corn sometimes show yields from the best adapted varieties that are nearly double those of the least suited varieties. This is as great a yield difference as any use of fertilizer often makes. Of course, a high-yielding variety also means a greater requirement for plant nutrients.

Natural or Man-made

Nutrient deficiencies can be either natural or man-made. Calcium deficiency in some Oregon coast soils is so great, due to excessive leaching, that even the bent grasses, which are acid-tolerant, may respond to liming. These soils are also likely to be phosphorus-deficient, due in part to the highly acid condition which renders phosphorus unavailable. Deficiencies sometimes result from accelerated erosion, which is a man-made problem. Likewise, deficiencies which result from excessive cropping and humus depletion are man-made. Fertilizer use to become most effective under such conditions must be combined with modified or perhaps entirely new farming methods designed to hold the soil and renew the humus.

The age of the soil is some indication of possible deficiencies. Soils may develop claypans with age and they may become leached with age. Some of the old "red hill soils" have shown more potassium deficiency than was anticipated, probably because of the long-continued leaching of the past. In greenhouse trials, clover has failed on some of these soils when phosphorus,

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Know Your Soil

VII. Magnesium-potassium Relation for Sweet Potatoes on Sandy Soils

By J. B. Hester, F. A. Shelton, and R. L. Isaacs, Jr.

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IT has been a proven fact for many years that adequate amounts of potassium in the soil or the use of high-potassium fertilizers increased the yield of root crops, particularly sweet potatoes. The literature on the research work on this subject is voluminous. However, some of this work is contradictory and the results inadequately explained.

Zimmerley of the Virginia Truck Experiment Station established in the twenties the fact that the best fertilizer mixture for sweet potatoes on the average Coastal Plain soil of Virginia was a 3-3-15. Present findings begin to point to the fact that under most conditions the relation of one available ion or plant nutrient in the soil in proportion to the other is the answer for the lack of response to the application of adequate amounts of potash for maximum production.

Working in Virginia in the late thirties with heavily fertilized and fertile truck soils[2] it was found that moderate applications of potash produced no increase in yield of potatoes. For example, on a Sassafras fine sandy loam no-fertilizer versus 1,000 pounds of 3-3-15 and 0-0-15 produced exactly the same yield, approximately 225 bushels per acre. However, 1,000 pounds of an 0-0-30 produced an increase over the other treatments of 85 bushels per acre. In other words, the cations and other plant nutrients were being brought into a more complete balance for sweet potatoes with the 300 pounds of potash.

About 1945 attention was focused on the fact that sweet potato growers in some sections were changing from the high-potash fertilizers to lower-potash fertilizers because they were getting better yields with the lower-potash fertilizers. Growers were changing from a 3-9-12 to a 3-12-6 fertilizer mixture, however, the general over-all yields declined. Field observations indicated that magnesium deficiency was prevalent and that the high-potash mixtures had a tendency to induce more magnesium deficiency than the low-potash mixtures.

Project Started in 1946

A project was started in 1946 with the Ranger sweet potato[1] to establish the amount of replaceable magnesium in the soil and magnesium-deficiency symptoms. It was found[3] that where the replaceable magnesium content of the soil was below 100 pounds per acre, magnesium deficiency was prevalent. Fertilizer experiments were then started to determine the influence of 2 per cent and 4 per cent magnesium oxide from two sources with 3-9-0, 3-9-6, 3-9-12, and 3-9-18 fertilizer mixtures used at the rate of 1,600 pounds per acre, one-half applied before planting and one-half as sidedressing.

TABLE I.

Treatment	Pounds per Acre			
	Round	Long	Seed	Total
Check	160	3,360	3,200	6,720
3-9-0	960	4,480	3,680	9,120
3-9-0 MgO	800	4,160	2,560	7,520
3-9-6	1,440	5,760	3,040	10,240
3-9-6 MgO	2,400	5,600	3,680	11,680
3-9-12	1,920	6,880	3,680	12,480
3-9-12 MgO	2,400	9,600	2,400	14,400
3-9-18	2,560	6,080	2,400	11,040
3-9-18 MgO	3,040	6,880	4,160	14,080

This established the fact that magnesium deficiency occurred first in the high-potash mixtures with the lower amounts of magnesium and that substantial increases in yield were established for both sources of magnesium, namely, dolomite and sulfate of magnesia. The 4 per cent magnesium oxide from dolomite with the 3-9-12 fertilizer mixture gave the largest yield, approximately 20,000 pounds per acre. The 3-9-18 without magnesium depressed the yield below the 3-9-12, and even with 4 per cent magnesium oxide, the yield was slightly depressed in respect to the 3-9-12 with 4 per cent magnesium oxide. Another interesting fact was brought out. The great increase in yield was with the long jumbo potatoes. However, the high-potash mixtures tended to increase the roundness of the potatoes. The yield of seed potatoes remained almost constant regardless of treatment. The 1949 data from the Sassafras sand is shown in Table I.

The foregoing studies seem to indicate that there is definitely a relationship between the yield and shape of potatoes and potassium and magnesium content of the fertilizer mixtures on soils with less than 100 pounds of replaceable magnesium.

In 1950 it was decided to use four fertilizer mixtures, 3-9-0, 3-9-6, 3-9-12, and 3-9-18 with 0, 2, 4, 6, and 8 per cent magnesium oxide, one-half derived from dolomite and one-half from sulfate of magnesia, applied 800 pounds underneath the row and 800 pounds by sidedressing. Each treatment was replicated five times on a Sassafras sand. The analysis of this soil is shown in Table II.

The summary of the results of this study is shown in Fig. 1. It is interesting to notice that in regard to the total yield, increasing the amounts of magnesium decreased the yield consistently with the 3-9-0; 2 per cent magnesium

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TABLE II.

Horizon	pH	CaO	MgO	Al	% Organic Matter	NH_4	P_2O_5	K_2O
0–10	5.5	136	12	T	0.5	Poor	33	86
10–33	5.7	125	11	N	0.2	Poor	7	24
33–60	5.9	100	9	N	0.1	Poor	3	44
60–	6.0	100	15	N	0.1	Poor	5	24

Expressed in pounds per acre (Hester sodium-acetate extraction procedure).

Fig. 1. Part of a herd of 400 brood cows that grazed all winter on a 125-acre field of fescue. They are seen here in early April grazing in an 80-acre field of fescue planted the previous October on a 2-year-old stand of sericea. Apparently they came through the winter in excellent shape.

Kentucky-31 Fescue for Grazing and Seed

By Barrington King

Soil Conservation Service, Spartanburg, South Carolina

"DON'T put this in your story because no one will believe it," Col. Carl Jones said, "but we pastured 400 head of cattle on this 125-acre field of fescue all last winter."

The car in which we were riding rolled across the firm, green carpet of fescue and came to a stop in the middle of the field. We got out and examined the sod and, frankly, it was hard to believe.

But we had seen enough that day to be in a believing mood. Six hundred and fifty head of sleek, white-face cattle were grazing on various parts of the 750 acres of Kentucky-31 fescue on the G. W. Jones and Sons farm. And 500 acres of the fescue was first-year growth. Nearly 200 acres had been planted in December on land that had been in cotton. The fescue came up to a perfect stand, but they wouldn't recommend planting it that late, ordinarily.

The 3,000-acre farm, near Huntsville, Ala., operated by Col. Jones and his brother, Brig. Gen. Edwin Jones, is using the fescue in a dual program, for grazing and seed production. They planted their first fescue in the fall of 1947, after having seen one of the five-acre observational plantings made from seed furnished by Soil Conservation Service nurseries to the Northeast Alabama

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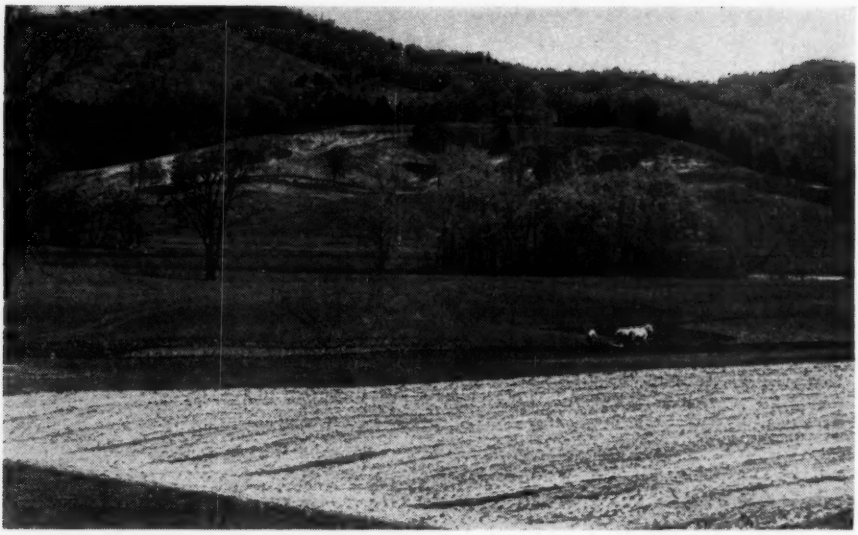


Fig. 1. The use of ground limestone has been the backbone of the Vermont farmer's grassland program.

The Vermont Farmer Conserves His Soil

By Thomas H. Blow

Production and Marketing Administration, Burlington, Vermont

MORE than 10,000 Vermont farmers are proving to themselves annually that saving and rebuilding their soils through soil-conserving practices is like money in the bank. Farm soils, to these Vermont farmers, are their factories. Their crops, livestock, milk, maple, and lumber are as interest on their investment "in saving soil and good farm management."

The early years of agricultural extension work in Vermont found the county agents pounding away year in and year out on the need for adding lime and fertilizers. Actual demonstration on hundreds of farms throughout the State produced plenty of evidence that one of the soil's first needs was lime. Farm soils needed lime to produce more and better quality grasses than the farmers were growing. It was needed even more as roughage production changed to a legume program. Yet, in the face of this evidence, the increase in the recommended usages was very slow. Education alone did not seem to be sufficient to get the job done. Something else was needed to change the farmer's thinking into action. The U. S. Department of Agriculture, through its Agricultural Conservation Program, provided in 1936 the vehicle to get a soil-building program under way.

Prior to 1936, when the "ACP" pro-

gram got under way, less than 3,500 tons of ground limestone were being used annually on the one million acres of the State's cropland. This was true, even in the face of the Vermont Agricultural Experiment Station's recommendations. These recommendations today are that Vermont's farm soils need upward of 400,000 tons of limestone per year. This large tonnage is needed, the Station feels, to adequately replace some of the already heavy calcium losses due to heavy cropping down through the years, and, likewise, to provide for the consistent crop production drain that occurs annually.

More Cattle Than People

Vermont, with its more cattle than people, is proud of the fact that it produces more than 140,000,000 gallons of milk annually. Yet, day in and day out, too little thought is given to the fact that this rich, white, body-building liquid takes away from the soil many thousands of pounds of calcium, phosphorus, potassium, and the minor mineral elements so necessary to plant and animal growth.

The layman, no doubt, will ask, "How far have we gone since those early years in replacing this tremendous drain of calcium through the medium of ground limestone or other materials in our Vermont soils?" In answer to this query, we do know that through the services of the Agricultural Conservation Program, the Vermont farmer has boosted the State's limestone usage to approximately 100,000 tons annually. But even with this increase, there still is a long way to go in doing the job of calcium replacement alone.

Other Replacements Necessary

In the same category, the trend is toward the lack of taking care of our soil's phosphorus needs. This trend, as with lime, is extremely critical.

The Vermont Experiment Station, through its soils studies, indicates a need of up to 225,000 tons of superphosphate annually. Through the Agricultural Conservation Program, the job of replacement of previous soil losses and taking care of current crop needs is going along at the slow rate of usage of 30,000 tons of 20 per cent superphosphate each year. Prior to 1936 the annual usage was less than 3,500 tons.

With calcium and phosphorus replacement, some progress is being made, but it is a far cry from the soil-rebuilding needs. Twenty-five per cent of the

Fig. 2. The early days of the Agricultural Conservation Program found many Vermont farmers broadcasting fertilizer on their fields by hand.

Fig. 3. Vermont County Agents have been prime boosters of the Agricultural Conservation Program since its inception in 1937. Here we see three of them—Messrs. Sinclair, Beebe, and Whitcomb—looking over an excellent ladino stand which has been well fed with lime, superphosphate, and potash.

job is being done through limestone and about 15 per cent with superphosphate, so there still is a long way to go.

The same is true of potassium, which reaches the soil through applications of potash, or farm manure. State Experiment Station findings point out that our soils can take and need 90,000 tons or more of potash annually. However, we shall not attempt to even quote the negligible amount that goes back to the soil yearly. Considerable progress was made, though, during the 1950 Agricultural Conservation Program when farmers used some 12,000 tons of a "phosphorus-potash" mixed fertilizer. Farmers can also contribute much potassium through the better use and conservation of farmyard manure.

Important Practices

The Vermont farmer is not confined to the use of lime, phosphorus, or potash practices alone under the program. In addition, he can and does make good use of such practices as clearing and reseeding for improved pastures. The orchardist gets help on mulching his producing trees, and the woodlot enthusiast can make greater progress through thinning, planting forest trees, and fencing out the sugar orchard from the grazing livestock. These and other supplemental practices on ditching, tile drainage, and building farm ponds round out an agricultural program of assistance that lends a hand to any farmer who is interested. It helps him in conserving his soil and managing his farm investment in a better manner than he could do it alone.

Farmer Committeemen

From the early years down to the present the Vermont farmer himself has played a tremendous part in seeing that the "ACP" work gets done. Each of the State's 14 counties has carried out its own program, applying it to the needs as they saw fit. Today, farmer-committeemen who are elected annually by their farmer neighbors supervise the annual sign-up for each year's program. On the same visit they check on the farm's performance under the previous year's practices.

It is doubtful if any more democratic procedure could be devised, because, through the farmer-committeemen idea, the program goes right back to the

grassroots where it belongs.

Thomas Jefferson once said, "The farmers farm it, but the land belongs to the people."

How true, yet so many do not feel conservation is one of society's responsibilities. To them we say, "We have good schools and continue to make them better. Why?" Because our children and their education are a responsibility of every individual. No one parent can do the job alone. "We have improved roads and we want still better ones. Who pays for them?" You and I who use them, and rightly so.

We need good soil and good farming to produce our "daily bread." In doing this, the farmer has a twofold job, that of production and providing good management. He can provide the latter, but in many instances he cannot do the entire job of agricultural conservation alone. It therefore becomes the individual's responsibility, as folks who live off the land, to see that as a society we do our part in leaving the farms and their soils better than when they were taken over.

Farmer Pays His Way

There are those who will say, "Why give all this help to the farmer?" We ask, "Is the farmer getting all these helps for nothing?" No, certainly not.

Since 1936 the amount of Government funds put into the Vermont "ACP" program totals $12,937,000. In that same period the Vermont farmer has contributed in cash and services rendered, an estimated $12,710,886, or approximately 50 per cent of the program cost. Furthermore, during the last six years, 1945 through 1950, the farmers of the State will have contributed of their own money and services a total of one and three-quarter million dollars more than was provided by the Government for carrying out farm practices under the Agricultural Conservation Program in the same period.

As evidence for the need of a sound soil-building program and the part which the program is playing in doing the job, we quote from a statement recently made by Verle Houghaboom, Assistant Extension Economist for the University of Vermont: "The Agricultural Conservation Program has a definite stake in the management plans of Vermont farms. It is a tool which can be profitably used by farmers in attaining a well-founded farm business. For example, many farmers who want to increase the size of their business may do so without buying or renting additional land, by identifying production on their present acreage. This can be done by clearing land for tillage or pasture, by seeding pastures, or improving land by drainage. Nothing more than just liming and fertilizing hay and pasture crops will go far toward increasing the carrying capacity of many farms. Proper management of the farm woodlot is another means of increasing the size of some farm businesses. Trees can be a paying crop. Above all, the Agricultural Conservation Program can and should be of great help to farmers in maintaining and building up the productive capacity of their farms."

Fig. 4. G. N. Baldwin, Hinesburg, Vermont, farmer (right) shows Park Newton, PMA State Committee Chairman (left) and Associate Dean Paul Miller (center) some of the excellent alfalfa made possible on his dairy farm as a result of the program. Baldwin owns several hundred acres, produces a million or more pounds of milk annually, and is one of the largest users of lime, superphosphate, and potash in the State's program.

Permanent Tame Pastures— A Wise Use of Land

By W. M. Nixon

Soil Conservation Service, Fort Worth, Texas

GOOD permanent tame pastures conserve soil and moisture, improve the soil productivity, in addition to providing the lowest cost livestock feed on the farm or ranch. Such pastures contain at least one domesticated perennial grass and usually one or more legumes and other grasses in a mixture. Permanent pastures often remain unplowed for several years but maintenance of the domesticated plants requires cultural practices such as mowing, cultivation, and fertilization periodically.

At Batesville, Arkansas, in 1946, Bermuda grass pasture lost only .89 inches rainfall per acre, while rotational crops lost from 8.76 inches to 12.76 inches, depending on the crop and method of cultivation.

Six years of measurement at the Blackland Experiment Station, Temple, Texas, showed $6.76 per acre per year in plant-food elements lost by erosion from cotton, corn, and oats in rotation on terraced land, compared to a loss from Bermuda grass of but $0.09.

In Missouri, over a 14-year period, bluegrass averaged 680 pounds soil lost per acre with an annual value in plant food of $0.12, compared to 5,560 pounds lost from land in a corn, wheat, and clover rotation with an annual value in plant food of $9.15.

Good permanent tame pastures reduce erosion by furnishing effective cover against raindrop splash and increase infiltration rates by keeping soil structure permeable. They use untapped soil fertility from deeper soil levels, bringing much of this plant food to the surface for re-use. They build and hold high soil-productivity levels. They provide protective cover for surface runoff.

In order to be effective in these ways, the pastures must be well developed as cover. They must contain deep-rooted plants and ample legumes in mixture and be managed well to maintain density and vigor. In general, the larger the percentage of perennials in the stand, the more effective the pasture will be in soil and moisture conservation.

Forage Production Values

Feed grown on permanent pastures is usually the lowest cost feed produced on farms. A study in Mississippi from 1937-39 showed that a 20-acre pasture furnished hay, silage, and concentrate feed values equal to $37.84 per acre of pastures, and the livestock did all the harvesting. Studies at Clemson Agricultural College, reported in 1942, show higher feed costs to produce milk as dependence on permanent pastures decreases.

Per cent of total Feed	Pasture No. 1	Pasture No. 2	Pasture No. 3
Grain	61.1	49.8	27.5
Hay	21.0	17.7	15.9
Silage	14.5	12.8	18.8
Pasture	3.4	19.7	37.8
Feed Cost per gallon milk*	16.5¢	13.6¢	10.9¢

*Each dairy enterprise produced 813 gallons milk per cow per year.

Permanent tame pastures can safely and profitably make use of many physical conditions on farms not safely or profitably usable for growing cultivated crops. Wet lands, some areas subject to overflow, lands too steep or rough for cultivation, and places where installation of necessary soil conservation or drainage measures for cultivation are impossible or too expensive to install are examples of such conditions.

Permanent tame pastures provide a lot more dependable support for the farm livestock enterprise than most annual or supplemental pastures, though the carrying capacity of some of these supplemental pastures may be more than that of permanent pastures for the short periods they are available. Much of the costly seasonal fluctuations in milk production and in periodic losses of weight in beef production so characteristic of enterprises lacking an improved pasture program can be minimized by developing sufficient permanent tame pasture acreage, plus, of course, enough supplements to give good green grass pasturage nearly the year 'round.

Typical beef cattle gains from grazing per acre per year from experimental work in the region are:

Cotton Branch Experiment Station, Arkansas, 1930–1939	388 to 559 lbs.
Northeast Louisiana Experiment Station, 1941–1947.	328 to 423 lbs.
Livestock and Forestry Branch, Experiment Station, Arkansas, 1944–1945	291 to 351 lbs.
Southeast Pasture—Fertility Research Station, Oklahoma, 1946–1948	58* to 217 lbs.

*Eroded timber soil with no fertilizer or lime applied.

Variations are caused both by differences in physical conditions and treatment given.

Selecting Sites

Since putting permanent tame pastures on an area involves decisions that affect land use for a long time, a conservation farmer or rancher needs to choose pasture areas carefully. Ample water for livestock must be available during any time that the pasture will be in use. If the land will support profitable mixtures of pasture plants, land unsuited for cultivation should be included in the permanent pasture area. However, those locations that will not allow development to high-producing tame pasture should be left for development to native vegetation—grass in the prairie and savannah areas, and trees in forested parts of the region.

Whenever tame pasture sites can be conditioned for mowing, it should be done, since this makes maintenance easier and allows supplemental hay use whenever a surplus of forage permits deferment. Occasionally seed crops of one or more pasture plants may be harvested for farm use or sale.

Determining Mixtures

Every permanent tame pasture should have a turf-forming perennial base grass as a foundation plant for erosion control and for pasture maintenance over long periods. In addition, each pasture mixture should include deep-rooted perennial plants to keep soil structure porous and to withstand periods of drought. Enough legumes should be in the mixture to keep nitrogen levels high and to develop a type of forage high in protein and total digestible nutrients. In a Georgia experiment, reported in the Georgia Experiment Station Fifty-second Annual Report, 1939-40, there were produced 1,609 pounds more forage per acre where winter clovers were in pasture sod, 998 pounds of which provided additional grass summer production following the period of growth of the winter clovers.

Mixtures that grow the best for physical conditions of site, produce most forage, will last the longest under grazing, and be most permanent, should be used. The mixtures must grow well together for the site conditions and maintain their vigor the best. They must furnish the best forage at times pasture will be used.

The following table contains some

pasture plants for use in various problem areas in soil conservation in the region. (See map.) Variations in physical conditions for a given pasture site may call for deleting, adding, or changing one or more plants in mixtures, but in general the species indicated will include the plants needed for effective soil and moisture conservation and profitable pasture use. For the site involved (left column) select a base grass (center column) and choose the legumes and grasses best for overseeding (right column) to develop desirable mixtures to use.

Cool-season perennial grasses should be planned in separate pastures from warm-season perennial grasses.

Maintenance and Management

A permanent tame pasture is not completely established until all the plants planned in the mixture have been established. This process, from base grass to last overseedings, will usually require two or more years and involve not only the sodding and seedings but all the application of soil amendments needed to develop thrifty stands. To keep pastures that have been so developed in a productive, thrifty condition, and to make optimum use of them, good pasture management is essential.

Some or all of the following jobs may be necessary to keep a given pasture vigorous.

1. ***Keep soil productivity levels high.***

a. Timely re-application of soil amendments. Phosphorus demands usually high; potash and lime requirements variable but often also high. Watch production, appearance, and vigor of plants as guide to soil amendment re-application needs; make use of reliable soil tests as much as possible.

b. Heavily fertilized seedings of annual legumes, periodically, to give extra boost to productivity levels. Heavily fertilized seedings of vetch or vetch-small grain mixture applied every 3 to 4 years to Bermuda grass base pastures in the humid parts of the region do wonders in increasing vigor and production of the succeeding grass crops as well as furnish a portion of needed winter supplemental green pasture. Singletary peas are also very valuable in increasing grass cover and vigor and provide good grazing. This pea is an excellent re-seeder.

2. ***Renovate base grasses periodically.*** This can often be done along with the periodic seeding of annual legumes. It is needed every 3 or 4 years or whenever either the vigor or density of the base grass shows noticeable decline. The invasion of broomsedge, weeds, and other hardy native plants is generally good evidence that such a base-grass renovation is needed. Sometimes, following this renovation process, it may be necessary to reestablish some annual species in the mixture. This is a good time to apply soil amendments.

3. ***Mow.*** Needed not only to prevent seeding of weed species but also to induce more palatable, more nutritious young growth of pasture plants. Mowing for weed control requires one or more clippings a year, timed carefully to prevent as many weed inflorescences from maturing seed as possible. Mowing to induce better growth of pasture plants should be timed to clip back maturing pasture plants about the time of translocation of plant food to below-ground plant parts—soon after seed maturity. New re-growth will be more succulent and nutritious. With Bermuda grass pastures a clipping a few weeks prior to the hot and often dry, late summer months will generally be profitable in inducing re-growth of good pasturage in late summer. When mowing can be done early enough, a good quality hay can often be harvested.

4. ***Use pastures with full regard for vigor of the plants.*** Plants get 95 per cent of their requirements from the air

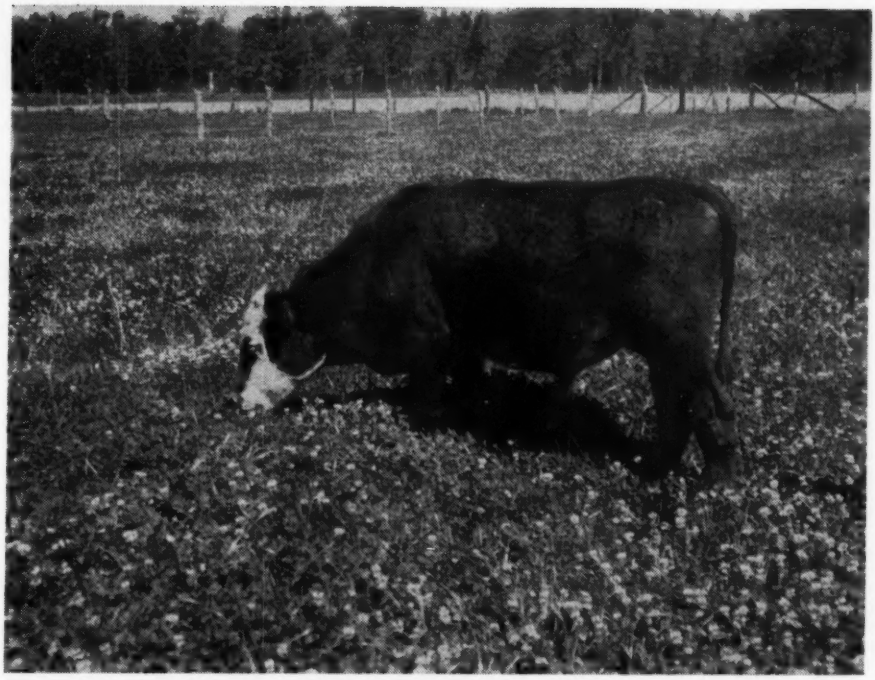
(*Turn to page* 41)

Above: **Problem areas in soil conservation in the Western Gulf Region, (Arkansas, Texas, Oklahoma, and Louisiana).**

Below: **Poor pasture, poor calf. Pastures such as this do not yield profitable returns.**

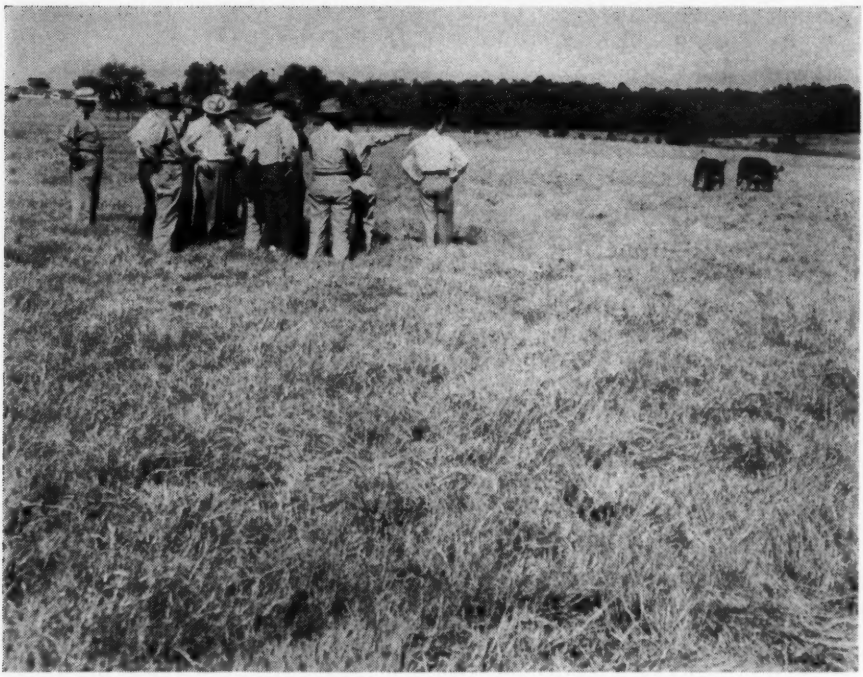
Above: **This mixture of grass and legumes supported as many as three animal units per acre in spring months.**

Below: **Thirty days grazing from this pasture resulted in enough increase in milk production and decrease in feed bill to more than pay the cost of land preparation, seeding, and fertilizing.**



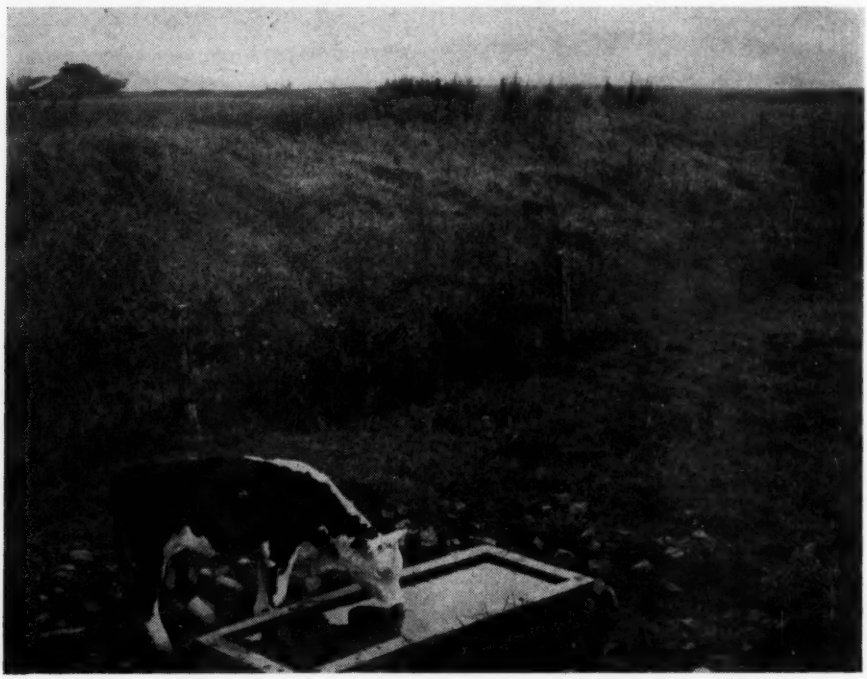
Above: **This pasture is fertilized with 300 lbs. superphosphate and 100 lbs. muriate of potash each year. From October 15 to March 15 this animal gained approximately 2 lbs. per day.**

Below: **A good Bermuda grass and clover pasture on the C. F. Cornelius farm near Idabel, Oklahoma.**



Above: **Members of a Pasture Improvement Contest tour see and discuss good pastures near Harrison, Arkansas.**

Below: **A watering trough below pond dam provides a readily accessible source of fresh, clean water.**



The Editors Talk

The Story of Soil Conservation

So much has been written and said about soil conservation in the United States that its importance is now fully recognized by almost everyone connected with agriculture and by great numbers in other industries. A million farmers in soil conservation districts and under other programs of the Service have now experienced first-hand the benefits to be derived personally from taking the best care of the Nation's greatest natural resource. And yet the job is far from completed and much more must be written and said to emphasize and re-emphasize the dangers of soil neglect, not only to our present but our future civilizations.

"It seems to me," Hugh H. Bennett, Chief of the Soil Conservation Service, says in his 1950 fiscal-year report to the Secretary of Agriculture, "that the very uncertainty of the world's political, economic, and military situations makes it imperative that we speed up our conservation work. In the near future, we must be able to say that our agricultural plant is stable and that its capacity for production, as far as we can see ahead, can be expanded to meet any anticipated needs without danger of serious damage to our future productive capacity."

By June 30, 1950, the report shows, 18.6 per cent of the conservation job had been completed, in addition to a considerable spread of unrecorded practices to farms both within soil conservation districts and outside. This is about one-fifth of the total job. Dr. Bennett expresses the belief that with adequate facilities, the job of applying basic conservation measures to the land could be completed in about 20 years, after which would remain the continuing task of maintaining the conservation improvements.

No better authority than Dr. Bennett can be quoted on this phase of our national welfare. Known as "The Father of Soil Conservation" he has become internationally famous for his practical approach to problems and the results obtained. Large numbers of technical and administrative representatives of foreign countries, despite many critical internal problems at home, have come to the United States to see and learn our methods of soil and water conservation. This is a fitting tribute to a long life's interest and devotion to a project for the betterment of all mankind.

Another fitting tribute is just appearing to the public in the form of a book—"Big Hugh" by Wellington Brink (Macmillan Company, New York, $2.75). This book not only is a factual and humorous recounting of a great man's life; it is the story of soil conservation. Louis Bromfield, in his preface, says, "I have seen, perhaps for the first time in history, a whole nation turning to right a wrong, to check an evil before it was forced to do so by utter disaster. I doubt that this could have been accomplished without the leadership and wisdom of Hugh Bennett. Certainly, without him the progress would have been infinitely slower."

The book will help to speed up the finishing of the "job."

New Rules for Good Pasture

"Research is setting up new rules for success with pastures and the results pay profitable returns in livestock gains," says Dr. W. M. Myers, Head of Forage Investigations for the Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture. Many recent experiments demonstrate that improved pastures produce as much livestock feed per acre on comparable land as high-yielding corn crops and considerably more than other grain crops. The cost per unit of pasture production is lower than for corn and for other grains. Studies of comparative costs per 100 pounds of total digestible nutrients show that production on improved pastures costs less than a third of corn for grain, about a third of corn for silage, and only one-fourth of oats for grain. Returns from pasture per man hour of labor are strikingly higher than for other cultivated crops—six times more than from corn, nine times more than from oats, and nearly ten times more than from barley.

The first rule of success in today's improved pasture, according to Dr. Myers, is the use of the new large, deep-rooted grasses and legumes recently selected for adaptation to different areas in the United States. The up-to-date farmer no longer buys a shotgun mixture of 15 to 20 grass and legume species to plant at high seeding rates (25 to 30 pounds per acre) in the hope that some of them will establish a stand. Precise information on adapted species now makes it possible for growers to buy simple mixtures, usually one grass and one legume, no more than four or five species at most. These are seeded at much lower rates than formerly used.

Plenty of fertilizer is the next rule for success in productive pastures. Dr. Myers stresses the need for comparatively large initial applications of fertilizer to insure good stands and additional applications after the pasture is established to replace nutrients from the soil.

Grassland management, he says, begins with a farmwide plan to fit livestock needs and to make full use of soils and climate. Drawn up on the basis of acreage in permanent pasture, these plans differ from farm to farm, but they have certain features in common. Renovating existing pastures is a major advance on many farms. Rotation pastures on cropland are meeting increased forage needs and hold tremendous potentialities for higher yields.

Dr. Myers sees an even distribution of forage production through the growing season as one of the big problems research has yet to solve. The well-established, adapted species are not superior in this respect. They, too, have peaks of production and mid-season declines when stock must be fed from some other source. The solution to this problem, in his opinion, is not in any single pasture or pasture mixture, but in careful integration of the entire forage program, making use of permanent pastures when available, preserving surplus production as hay or silage, and developing supplemental pastures to fill seasonal production gaps.

With the anticipated shortages of labor on farms, the high output per man hour that can be obtained from pastures has an added significance in our national food production program. With a nationwide grasslands program being formulated and as far as possible put into effect this year, Dr. Myers' conclusions based on wide investigation assume an added importance. They should be of great value to advisory groups instituting local pasture improvement programs.

"Every blade of grass is a study; and to produce two where there was but one is both a profit and a pleasure."—ABRAHAM LINCOLN.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay [1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941.....	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942.....	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947.....	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948.....	30.4	48.2	155.0	222.0	129.0	200.0	18.45	67.20	....
1949.....	28.6	46.3	128.0	214.0	119.0	186.0	16.55	43.40	....
1950									
January.....	26.47	39.7	136.0	215.0	115.0	192.0	17.15	43.60	....
February....	27.50	34.1	133.0	221.0	116.0	193.0	16.75	43.60	....
March.....	28.05	32.0	132.0	222.0	119.0	198.0	16.45	43.00	....
April.....	28.74	....	134.0	228.0	126.0	201.0	16.65	44.40	....
May.....	29.24	48.5	128.0	228.0	134.0	204.0	17.25	45.20	....
June.....	29.91	49.7	127.0	211.0	136.0	193.0	16.05	46.20	....
July.....	33.05	45.5	127.0	208.0	144.0	199.0	15.15	52.00	....
August.....	36.95	53.1	122.0	218.0	144.0	197.0	15.45	70.90	....
September...	39.98	55.4	105.0	192.0	144.0	194.0	15.55	78.80	....
October.....	38.90	55.1	85.8	154.0	137.0	191.0	15.85	81.50	....
November....	41.13	52.5	87.8	148.0	137.0	194.0	16.45	98.40	....
December....	40.36	47.2	88.9	173.0	145.0	203.0	17.05	102.00	....

Index Numbers (Aug. 1909—July 1914 = 100)

1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	89	81	109	74	87	110
1938.....	69	196	80	79	76	64	57	97	88
1939.....	73	154	100	84	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	105	117	107	82	211	129
1942.....	153	369	168	134	143	124	91	202	163
1943.....	160	405	188	235	174	154	125	231	245
1944.....	167	420	214	216	170	160	139	234	212
1945.....	181	366	205	232	198	170	127	227	207
1946.....	263	382	178	248	212	209	141	319	182
1947.....	257	380	232	248	336	259	148	381	226
1948.....	245	482	222	253	201	226	155	298	214
1949.....	231	463	184	244	210	210	139	192	201
1950									
January.....	213	397	195	245	179	217	144	193	261
February....	222	341	191	252	181	218	141	193	203
March.....	226	320	189	253	185	224	139	191	168
April.....	232	...	192	260	196	227	140	197	205
May.....	236	485	184	260	209	231	145	200	178
June.....	241	497	182	240	212	218	135	205	182
July.....	267	455	182	237	224	225	128	231	200
August.....	298	531	175	248	224	223	130	314	164
September...	322	554	151	219	224	219	131	349	126
October.....	314	551	123	175	213	216	134	361	138
November....	332	525	126	169	213	219	139	436	188
December....	325	472	128	197	226	230	144	452	211

Wholesale Prices of Ammoniates

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per Unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per Unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
1950						
January	3.00	2.32	10.27	13.79	10.26	10.08
February	3.00	2.32	9.37	13.45	8.96	8.96
March	3.00	2.32	9.70	13.01	10.17	9.34
April	3.00	2.32	10.34	12.58	10.39	8.19
May	3.00	2.05	10.74	11.97	10.14	7.59
June	3.00	1.71	10.55	10.79	9.41	7.36
July	3.00	1.71	11.53	10.71	9.35	8.74
August	3.00	1.71	11.44	11.06	10.62	9.87
September	3.00	1.71	11.44	10.85	10.85	10.32
October	3.00	1.71	11.86	10.63	10.62	10.32
November	3.00	1.68	11.96	10.63	10.85	10.62
December	3.00	1.88	13.48	10.95	10.93	10.93
Index Numbers (1910-14 = 100)						
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
1950						
January	112	81	293	391	304	286
February	112	81	268	381	266	255
March	112	81	277	369	302	265
April	112	81	295	356	308	233
May	112	72	307	339	301	216
June	112	60	301	306	279	209
July	112	60	329	303	277	248
August	112	60	327	313	315	280
September	112	60	327	307	322	293
October	112	60	339	301	315	293
November	112	59	342	301	322	302
December	112	66	385	310	324	311

Wholesale Prices of Phosphates and Potash * *

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[2]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[2]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1925	.600	2.44	6.16	.584	.860	23.72	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
1950							
January	.762	3.76	5.47	.375	.720	14.50	.200
February	.760	3.76	5.47	.375	.720	14.50	.200
March	.760	3.76	5.47	.375	.720	14.50	.200
April	.760	3.76	5.47	.375	.720	14.50	.200
May	.760	3.76	5.47	.375	.720	14.50	.200
June	.760	3.76	5.47	.336	.647	12.77	.176
July	.760	3.76	5.47	.368	.704	13.98	.193
August	.760	3.76	5.47	.368	.704	13.98	.193
September	.760	3.75	5.47	.368	.704	13.98	.193
October	.760	3.73	5.47	.386	.704	13.98	.193
November	.760	3.73	5.47	.386	.732	14.72	.193
December	.798	3.73	5.47	.420	.796	16.00	.210
Index Numbers (1910-14 = 100)							
1925	110	68	126	82	90	98	74
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
1950							
January	142	104	112	68	76	60	83
February	142	104	112	68	76	60	83
March	142	104	112	68	76	60	83
April	142	104	112	68	76	60	83
May	142	104	112	68	76	60	83
June	142	104	112	63	68	53	80
July	142	104	112	67	74	58	82
August	142	104	112	67	74	58	82
September	142	104	112	67	74	58	82
October	142	103	112	70	74	58	82
November	142	103	112	70	77	61	82
December	149	103	112	75	84	66	85

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1925	156	153	151	112	100	131	109	80
1926	146	150	146	119	94	135	112	86
1927	141	148	139	116	89	150	100	94
1928	149	152	141	121	87	177	108	97
1929	148	150	139	114	79	146	114	97
1930	125	140	126	105	72	131	101	99
1931	87	119	107	83	62	83	90	99
1932	65	102	95	71	46	48	85	99
1933	70	104	96	70	45	71	81	95
1934	90	118	109	72	47	90	91	72
1935	109	123	117	70	45	97	92	63
1936	114	123	118	73	47	107	89	69
1937	122	130	126	81	50	129	95	75
1938	97	122	115	78	52	101	92	77
1939	95	121	112	79	51	119	89	77
1940	100	122	115	80	52	114	96	77
1941	123	130	127	86	56	130	102	77
1942	158	149	144	93	57	161	112	77
1943	192	165	151	94	57	160	117	77
1944	196	174	152	96	57	174	120	76
1945	206	180	154	97	57	175	121	76
1946	234	197	177	107	62	240	125	75
1947	275	231	222	130	74	362	139	72
1948	285	250	241	134	89	314	143	70
1949	249	240	226	137	99	319	144	70
1950								
January	235	238	221	135	96	316	142	72
February	237	237	223	132	96	286	142	72
March	237	239	223	134	96	305	142	72
April	241	240	223	135	96	313	142	72
May	247	244	228	132	91	311	142	72
June	247	245	230	126	85	293	142	66
July	263	247	238	128	85	301	142	70
August	267	248	243	131	85	321	142	70
September	272	252	247	131	85	324	142	70
October	268	253	247	131	85	323	142	73
November	276	255	250	132	85	328	142	74
December	286	257	253	138	88	346	149	78

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] All potash salts now quoted F.O.B. mines only: manure salts since June 1941, other carriers since June 1947.

**** The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Annual Report, State Chemist of Florida, year ending Dec. 31, 1949," USDA, Tallahassee, Fla., J. J. Taylor.

"Effects of Fertilizers and Seeding on the Establishment of Grazed Firebreaks," Agr. Exp. Sta., Texas A & M College, College Station, Texas, P. R. 1247, May 11, 1950, T. H. Silker, L. E. Crane, and J. C. Smith.

"Efficient Use of Dairy Manure," Agr. Exp. Sta., Univ. of Vt., Burlington, Vt., Pamp. No. 24, Aug. 1950, A. R. Midgley.

Soils

"Handling Northeastern Illinois Soils," Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 663, June 1950, W. F. Purnell, E. D. Walker.

"Potato Irrigation, Costs and Practices in Suffolk County, New York, 1946," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y., Bul. 862, Sept. 1950, R. N. Hampton, R. G. Murphy, and P. R. Hoff.

"Soil Testing Reduces Guesswork," Ext. Serv., N. C. State College, Raleigh, N. C., Oct. 1950, W. L. Nelson and C. D. Welch.

"Upkeep of Southern Great Plains Wheatlands," Agr. Exp. Sta., Okla. A & M College, Stillwater, Okla., Mimeo. Cir. M-204, Aug. 1950, H. H. Finnell.

"Irrigation and Variety Trials with Lettuce in the Lower Rio Grande Valley," Agr. Exp. Sta., Texas A & M College, College Station, Texas, P. R. 1258, July 8, 1950, M. E. Bloodworth, N. P. Maxwell, P. E. Ross, and W. R. Cowley.

"Economic Land Classification of Essex County," Bul. 433, Mar. 1950, G. W. Patteson, Z. M. K. Fulton, and A. J. Harris; "Economic Land Classification of Madison County," Bul. 434, Mar. 1950, G. W. Patteson and A. J. Harris; "Economic Land Classification of Charlotte County," Bul. 441, Sept. 1950, G. W. Patteson, Z. M. K. Fulton, and A. J. Harris; "Economic Land Classification of Carroll County," Bul. 442, Sept. 1950, G. W. Patteson and Z. M. K. Fulton, Jr., Agr. Exp. Sta., Blacksburg, Virginia.

"Soil, Water, and Crop Management Investigations in The Columbia Basin Project," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Bul. 520, Nov. 1950.

"Soil Survey, Marshall County, Kentucky," Agr. Exp. Sta., Lexington, Ky., Series 1938, No. 29, Sept. 1950, W. J. Leighty and C. E. Wyatt.

"Soil Survey, Otoe County, Nebraska," Agr. Exp. Sta., Lincoln, Neb., Series 1940, No. 6, Aug. 1950, T. E. Beasley, W. J. Moran, V. W. Filley, C. E. Pilcher, and C. R. Buzzard.

"Conservation Irrigation," USDA, Wash., D. C., Agr. Inf. Bul. 8, May 1950, A. W. McCulloch and W. D. Criddle.

"The Occurrence of Barium in Soils and Plants," USDA, Wash., D. C., Tech. Bul. 1013, Sept. 1950, W. O. Robinson, R. R. Whetstone, and Glen Edgington.

"Rates and Amounts of Runoff for the Blacklands of Texas," USDA, Wash., D. C., Tech. Bul. 1022, July 1950, R. W. Baird and W. D. Potter.

"Sound Land Classification Rests on Soil Surveys," USDA, Agr. Res. Adm., Beltsville, Md., June 1950.

"Southwest Region Annual Report, Fiscal Year Ending June 30, 1949," USDA, S. C. S., Albuquerque, New Mex., C. Luker.

"Southwest Region Annual Report, Fiscal Year Ending June 30, 1950," USDA, S. C. S., Albuquerque, New Mex., C. Luker.

Crops

"Tomato Production in California," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., Cir. 167, June 1950, J. H. MacGillivray, A. E. Michelbacher, and C. E. Scott.

"Division of Field Husbandry, Soils and Agricultural Engineering," P. R. 1936-1948, Central Exp. Farm, Ottawa, Ontario, Canada, P. O. Ripley.

"Lawns, Their Preparation and Care," Manitoba Dept. of Agr. and Immigration, Winnipeg, Manitoba, Canada, Pub. No. 233, Mar. 1950, F. J. Weir.

"Strawberry Growing in Manitoba," Manitoba Dept. of Agr. and Immigration, Winnipeg, Manitoba, Canada, Pub. No. 234, Mar. 1950, E. T. Andersen.

"The Production, Harvesting and Curing of Cigar Tobacco," Dominion Exp. Sta., L'As-

somption, Que., Canada, Pub. 832, Farmers' Bul. 160, June 1950, R. Bordeleau.

"Raspberries and Blackberries," Dept. of Agr., Ottawa, Ontario, Canada, Pub. 836, Cir. 183, May 1950.

"Gooseberry Culture," Dept. of Agr., Ottawa, Ontario, Canada, Pub. 839, Cir. 185, July, 1950.

"Field Beans in Canada," Dept. of Agr., Ottawa, Ontario, Canada, Pub. 843, Farmers' Bul. 164, 1950, W. G. McGregor, A. J. MacLean, and V. R. Wallen.

"Small Fruit Growing in Alberta," Univ. of Alberta, Dept. of Ext., Edmonton, Alberta, Canada, Bul. 54, Mar. 1950, R. J. Hilton and O. D. Lancaster.

"Gardenias in Florida," Agr. Ext. Serv., Univ. of Fla., Gainesville, Fla., Bul. 145, Aug. 1950, J. V. Watkins.

"Ground Covers for Florida Gardens," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 473, Sept. 1950, J. M. Crevasse, Jr.

"The Lychee in Florida," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 471, Aug. 1950, M. Cobin.

"Winter Grazing," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., E. D. Alexander, J. B. Preston, and J. R. Johnson.

"Watermelon Production in Hawaii," Univ. of Hawaii, Honolulu, Hawaii, Agr. Ext. Cir. 288, July 1950, Yukio Nakagawa.

"Report on Agricultural Research for the Year Ending June 30, 1949," Agr. Exp. Sta., Iowa State College, Ames, Iowa.

"Blueberry Culture in Massachusetts," Agr. Exp. Stat., Univ. of Mass., Amherst, Mass., Bul. 358, Rev. June 1950, J. S. Bailey, H. J. Franklin, and J. L. Kelley.

"The Home Fruit Planting," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., Rev. June 1950, L. C. Snyder.

"Research for New Mexico Agriculture," 60th A. R., Agr. Exp. Sta., N. Mex. College of Agr., State College, N. Mex.

"Hay and Pasture Seedings," Cornell Univ., Ithaca, N. Y., Cornell Ext. Bul. 781, Jan. 1950.

"Newer Varieties of Vegetables for 1950," Cornell Univ., Ithaca, N. Y., Cornell Ext. Bul. 782, Jan. 1950, P. Work and G. O. Elle.

"Atlas Wheat," Agr. Exp. Sta., N. C. State College, Raleigh, N. C., Spec. Cir. No. 8, Sept. 1950, G. K. Middleton and T. T. Hebert.

"Murphy and Wolcott Blueberries," Agr. Exp. Sta., N. C. State College, Raleigh, N. C., Spec. Cir. No. 10, June 1950, E. B. Morrow and G. M. Darrow.

"Field Corn Production on the Umatilla Irrigation Project," Sta. Bul. 480, June 1950, C. A. Larson, F. S. Viets, and R. W. Leamer; "Sprouting Broccoli," Ext. Bul. 704, July 1950, A. G. B. Bouquet; "Growing Snap Beans for Market and for Manufacture," Ext. Bul. 705, July 1950, A. G. B. Bouquet; "Growing Sweet Corn for Market and Manufacture," Ext. Bul. 706, July 1950, A. G. B. Bouquet; "Forage Crops for Coast Counties of Oregon," Ext. Bul. 707, July 1950, H. B. Howell and A. S. King; Ext. Serv. Oreg. State College, Corvallis, Oreg.

"Some Interesting Perennials for the Home Grounds," Agr. Ext. Serv., Pa. State College, State College, Pa., Cir. 370, Oct. 1950, A. O. Rasmussen.

"Comparative Effects of Various Organic Mulches and Clean Cultivation on Yields of Certain Vegetable Crops," Agr. Exp. Sta., Pa. State College, State College, Pa., P. R. No. 35, August 1950, F. M. Isenberg and M. L. Odland.

"Grasses and Legumes for South Dakota," Agr. Exp. Sta., S. D. State College, Brookings, S. D., Cir. 81, May 1950, M. W. Adams, J. G. Ross, W. W. Worzella, and A. N. Hume.

"A Handbook of Peanut Growing in the Southwest," Agr. Exp. Sta., Texas A & M College, College Station, Texas, Bul. 727, also, Agr. Exp. Sta., Okla. A & M College, Stillwater, Okla., Bul. B-361, November 1950.

"Cabbage Variety Trials in the Lower Rio Grande Valley, 1949-50," P. R. 1257, July 6, 1950, C. A. Burleson, J. S. Morris, P. W. Leeper, and W. R. Cowley; "Effect of Rootstocks on Yield of Grape Varieties at Montague," P. R. 1259, July 20, 1950, U. A. Randolph; "Greater Profits from Better Grape Varieties," P. R. 1260, July 20, 1950, U. A. Randolph; "Grain Sorghum Variety Tests at Lubbock, 1947-49," P. R. 1265, Aug. 7, 1950, D. L. Jones, J. Box, and E. L. Thaxton, Jr.; "Yield and Adaptation of Certain Forage Species in the Lower Rio Grande Valley," P. R. 1269, Sept. 1, 1950, E. M. Trew, Jr.; Agr. Exp. Sta., Texas A & M College, College Station, Texas.

"Vegetable Garden Suggestions for Virginia Farmers," Cir. 475, Feb. 1950, F. S. Andrews, L. C. Beamer, and F. H. Scott; "Growing Small Grain," Cir. 502, July 1950; "Boxwood," Cir. 503, July 1950, A. G. Smith, Jr.; "Winter Cover Crops," Cir. 505, Sept. 1950; "What's New in Oats?" Cir. 506, Sept. 1950; Agr. Ext. Serv., Va. Poly. Inst., Blacksburg, Va.

"Strawberries for West Virginia Farms," Agr. Exp. Sta., W. Va. Univ., Morgantown, W. Va., Cir. 64, Rev. May 1950, W. H. Childs.

"Performance of Regional Strains of Ranger Alfalfa," Agr. Exp. Sta., Univ. of Wis., Madison, Wis., Res. Bul. 171, Sept. 1950, D. Smith and L. F. Graber.

"Growing Raspberries & Blackberries in Wisconsin," Agr. Ext. Serv., Univ. of Wis., Madison, Wis., Sten. Cir. 240, Rev. Feb. 1950, J. G. Moore.

"Alfalfa Variety Trials in Wyoming," Agr. Exp. Sta., Univ. of Wyoming, Laramie, Wyoming, Bul. 297, May 1950, R. Lang.

"Ornamental Woody Vines for the Southern Great Plains," Farmers' Bul. No. 2015, July 1950, E. M. Johnson; "Commercial Growing and Harvesting of Sweetpotatoes," Farmers' Bul. No. 2020, Aug. 1950, V. R. Boswell; "Rice Culture in California," Farmers' Bul. 2022, Sept. 1950, J. W. Jones; USDA, Wash.

"Identification of Brassicas by Seedling Growth or Later Vegetative Stages," USDA, Wash., D. C., Cir. No. 857, Sept. 1950, A. F. Musil.

"Report on Exploratory Investigations of Agricultural Problems of Alaska," USDA, Wash., D. C., Misc. Pub. No. 700, December 1949.

"Imported Varieties of Dates in the United States," USDA, Wash., D. C., Cir. No. 834, July 1950, R. W. Nixon.

Economics

"Labor and Material Requirements, Costs of Production and Returns on Florida Irish Potatoes," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 472, Sept. 1950, D. L. Brooke and A. H. Spurlock.

"Labor and Material Requirements, Costs of Production and Returns on Florida Tomatoes," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 474, Sept. 1950, D. L. Brooke and A. H. Spurlock.

"Facts and Figures Annual Potato Summary, Crop of 1949," Dept. of Agr., Trenton, N. J., Cir. No. 377, May 1950.

"Inventory of Land Use in North Carolina," Agr. Exp. Sta., N. C. State College, Raleigh, N. C., Tech. Bul. No. 93, Nov. 1950, J. E. Mason and G. W. Forster.

"The Economics of Grass Seed Production in the Willamette Valley, Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 484, Sept. 1950, E. A. Hyer, M. H. Becker, and D. C. Mumford.

"An Economic Study of Family-Sized Farms in Puerto Rico—III. La Plata Farm Security Administration Farms, 1943-44, 1944-45," Agr. Exp. Sta., Univ. of Puerto Rico, Rio Piedras, P. R., Bul. No. 79, Apr. 1950, G. Serra and M. Pinero.

"Keeping Up on the Farm Outlook," Agr. Ext. Serv., State College of Wash., Pullman, Wash., Ext. Cir. 165, Oct. 31, 1950, K. Hobson.

"Keeping Up on the Farm Outlook," Agr. Ext. Serv., State College of Wash., Pullman, Wash., Ext. Cir. 167, Nov. 30, 1950, K. Hobson.

"Peppermint Oil—An Economic Study," Agr. Exp. Sta. State College of Wash., Pullman, Wash., Pop. Bul. No. 199, Aug. 1950, L. N. Liebel.

"The 1951 Handbook of Conservation Practices for: 1061, N. J.; 1061, Minn.; 1061, Ark.; 1061, Del.; 1061, La.; 1061, Md.; 1061, Miss.; 1061, N. H.; 1061, N. Dak.; 1061, Pa.; 1061, R. I.," Pro. and Mkt. Adm., USDA, Wash., D. C.

"Supplement for 1949 to Consumption of Food in the United States 1909-48," USDA, Wash., D. C., Misc. Pub. No. 691, Sept. 1950.

"Agricultural Outlook Charts, 1951," USDA, Wash., D. C., Oct. 1950.

"Foreign Agricultural Outlook Charts 1951," USDA, Wash., D. C., Oct. 1950.

"Crops and Markets," USDA, Wash., D. C., 1950 Edition, Vol. 27.

Soil Properties . . .

(*From page* 16)

sulfur, and nitrogen were provided, but grew well when potassium was added to the above combination. Deficiencies are likely to increase in number and severity as the soil ages. Much can happen to a soil or the material from which it is formed in a period of a few hundred thousand or perhaps a few million years, over which nature's tools have been operating to develop certain properties that are sometimes limitations to plant growth.

The most fertile soils of western Oregon, such as the Chehalis series, sometimes called second bottom, are probably some of the more recent formations. The best of these soils are deep and permeable, due to a porous, granular sponge structure; and they are well supplied with nutrients, including calcium which keeps the soil near neutral. The soils are too young to have claypan subsoils, in fact there is little differentiation of horizons anywhere in the profile. But not all Chehalis soils are good, and the name Chehalis is not a guarantee against a deficiency. Any soil may develop one or more deficiencies in time.

The need for lime, governed by the reaction of the soil, may determine availability of the natural phosphate of the soil, and therefore the need or the response to phosphate fertilization. Experimental data have shown that as an acid soil approaches neutrality due to liming, phosphate availability increases, sometimes to the extent that a soil which responded to phosphate fertilization in the acid condition no longer re-

sponds after liming. Considering the common crops of agriculture, soils are most productive when kept near neutral in reaction.

Greenhouse trials may be used to exaggerate nutrient deficiencies and thus sometimes to eliminate doubts about probable responses. Using the sunflower as an indicator plant, one soil showed a rather minor response to either phosphorus or nitrogen when each was used alone. The response to treble superphosphate was about 17 per cent increase in growth and to nitrogen 52 per cent, indicating that the deficiency was greater for nitrogen than for phosphorus. The same rate of application, using both nitrogen and phosphorus, increased the growth by 319 per cent. When the phosphorus deficiency was corrected, use of nitrogen gave six times as much increase as when the phosphorus deficiency was not corrected. Correction of the nitrogen deficiency enabled the phosphorus treatment to produce 16 times as much increase as when the same amount of phosphorus was supplied without application of nitrogen. These data indicate that the soil was seriously in need of both nitrogen and phosphorus, but that the need for nitrogen was somewhat greater than the need for phosphorus for sunflower growth.

In judging fertilizer needs of soils and in evaluating crop responses, therefore, it becomes necessary to know the properties of the soil, physical as well as chemical, and to know the plant and the biological significance attached to both the plant and its soil environment. It is necessary to recognize that there are probably several limiting factors operating to keep yields down. Among these may be climate, available soil moisture, and the presence or absence of destructive or beneficial soil organisms, as well as the past fertilizer program, crop rotation, crop variety, humus renewal, tillage operations, and other things that may affect yields.

Fertilizer rates are also significantly related to the appearance of nutrient deficiency. As the most prominent deficiencies are corrected and yields are increased, other deficiencies may appear. What is enough of any element for a 30-bushel yield of grain may prove inadequate as the yields rise to 50 to 60 bushels. On small experimental plots, wheat yields have been pushed to better than 80 bushels in western Oregon and slightly over 100 bushels in eastern Oregon. Such yields require much of everything that plants use from the soil. Big yields naturally exhaust fertility faster (for those elements not in the fertilizer) and therefore require more complete fertilization and better farming practices generally to keep the soil in a high state of productivity. The farmer who said that he fertilizes rented land heavily but that he didn't fertilize his own because he didn't want to exhaust his soil may have been partially right, but probably he was overlooking his best chance for some profitable crop increases from his own land. And he failed to realize that fertilizers can be used to improve the soil and that their use can be profitably combined with other good soil-improving practices.

The ever-increasing use of fertilizers in Oregon is associated with greater interest in all the factors which affect yields and profits in crop production, whether it be sprays for insects, disease, weed control, humus renewal, better varieties, or some other problem. The rate of fertilizer application is increasing. To use 100 pounds of nitrogen per acre in some form of fertilizer (more sometimes) is not uncommon. On valuable crops, especially small fruits and vegetables, and on specialty crops of high acre value, such as mint, use of a complete fertilizer is common practice. Farmers are definitely striving for bigger yields, 1,500 pounds or more of ryegrass seed, sometimes 1,500 pounds of cabbage seed, 14 tons of snap beans, a carrying capacity of four cows per acre on irrigated and fertilized pastures, and similar record production of other crops. While these yields are much above average, they are more and more sought after. Good soil, good

management, and adequate fertilizer use are making crop yield records that at one time would have been thought impossible.

Progress has not been halted by difficulties, such as increasing disease and insect pests, which both the scientist and the farmer have ably attacked. Even the present top yields are nearly sure to be surpassed in the not too distant future. There is some glamour and usually both profit and satisfaction to stimulate efforts to reach high production.

Permanent Tame Pastures

(*From page* 26)

through photosynthesis. If too great a proportion of the green, leafy parts of the plants are consumed and trampled by livestock, the plants are starved and weakened. Though only broad terms can be applied to pasture plants in general, good management will compromise on a 50-50—consume half and leave half—basis. The taller the habit of growth of the pasture plant, the greater the minimum height below which it should not be grazed. The taller grasses and legumes may require minimum heights of 6 inches or more, if they are to be fully productive and maintain themselves well in the pasture mixture. Low-growing turf grasses may be grazed lower if rested intermittently. Grazing should be rotated and deferred for a given pasture each year to allow a recovery of plants and development of new growth of high forage value. Heavy grazing towards the normal end of the growing season of a perennial may lessen the translocation of plant food to the crowns and underground parts and weaken the plant during dormancy and for emergence the following year.

Winter-killing in the northern part of the region and lowered yields in succeeding years are results of too heavy grazing too late in the growing season. It is poor soil and moisture conservation, too. After-frost grazing does not decrease vigor since only dead material is taken; however, this type of grazing usually requires heavy concentrate feeding as the cured grass growth is not high in essential elements for animal nutrition.

5. ***Rest pastures seasonally.*** This can best be done by being sure that each conservation farm plan provides for enough seasonal supplemental pasture crops. Having both cool-season and warm-season permanent pastures also assures the opportunity to rest each pasture seasonally.

6. ***Re-seed pasture plants that have gradually disappeared from the mixtures.*** The maintenance of desired mixtures is a delicate balancing feat and is easily upset by use, vagaries of the weather, and by fluctuation in available plant-food elements. In spite of careful attention to use and soil-amendment details, one or more species may need re-establishment periodically. Keep a careful check on how well each plant is maintaining itself in the mixture. Deferment or careful use may need to follow re-seeding operations.

7. ***Be sure that ample water distribution, salting and feeding locations, fences and gates are planned to allow for desired confinement and movement of stock.***

a. Each pasture needs ample water, distributed properly to prevent concentrations.

b. Salting and feeding locations should be chosen to prevent undue livestock concentration, and should be on areas not highly erodible.

c. Pastures to be used at different times should be fenced separately.

Problem area in soil conservation, and site	Suitable base grasses	Legumes and grasses for overseeding
Ozark Highlands—deep, heavy, moist soils from limestone, and the waxy colluvial soils from limestone, mostly north and east exposures.	Canada bluegrass (on less productive sites) Kentucky bluegrass (best sites only) Smooth brome (best sites only) Tall fescue	Orchard grass Timothy Alsike clover Hop, bighop clover White, ladino clover Red clover Annual lespedezas Black medic
Ozark Highlands—Upland with chert mantles, major limestone influence, average or better moisture, mostly north and east exposures.	Orchard grass	Hop, bighop clover Red clover Annual lespedezas
Ozark Highlands—Soils without chert mantles, lighter, sandier, drier, and more acid soils, mostly south and west exposures.	Bermuda grass	Hop, bighop clover Annual lespedezas Sericea lespedeza
Ozark Highlands—Imperfectly drained flatwoods.	Bermuda grass Tall fescue Red top	Alsike clover Hop, bighop clover White clover Annual lespedezas
Ouachita Highlands—All heavier and more moist soils, including bottomlands except very sandy bottomlands.	Bermuda grass Dallis grass (southern part) Tall fescue Red top	Dallis grass Italian ryegrass Alsike clover Crimson clover Hop, bighop clover White, ladino clover Annual lespedezas Singletary peas (from central Arkansas south)
Ouachita Highlands—All lighter, sandier soils, usually drier upland sites, and sandy bottomlands.	Bermuda grass	Hop, bighop clover Annual lespedezas Sericea lespedeza Vetch
Cherokee Prairies—Moist to wet sites; heavy soils.	Bermuda grass Smooth brome (north) Tall fescue Red top	Italian ryegrass Alsike clover Crimson clover Hop, bighop clover White, ladino clover Annual lespedezas
Cherokee Prairies—Lighter soils of good depth (shallow and very shallow uplands better for native range).	Bermuda grass KR bluestem	Italian ryegrass Hop, bighop clover Annual lespedezas Sericea lespedeza Vetch
Bluestem Hills—Moist, fertile sites only (all other conditions better for native range).	Bermuda grass Smooth brome Tall fescue	Italian ryegrass Hop, bighop clover White, ladino clover Annual lespedezas Black medic Biennial sweetclovers Sericea lespedeza

Problem area in soil conservation, and site	Suitable base grasses	Legumes and grasses for overseeding
Cross Timbers—Bottomland sites with favorable moisture conditions.	Bermuda grass KR bluestem Tall fescue	Burclovers Crimson clover Hop, bighop clover White, ladino clover Annual lespedezas Sericea lespedeza Black medic Vetch
Cross Timbers—Upland sites.	Bermuda grass KR bluestem	Annual lespedezas Sericea lespedeza Vetch
Reddish Prairies—Bottomland and moist upland sites only (other conditions better for native range).	Bermuda grass KR bluestem Tall fescue	Sweetclovers Vetch
Rolling Red Plains—Sites with favorable moisture only (other conditions better for native range).	Bermuda grass KR bluestem	Sweetclovers Vetch
Bottomland—All sites.	Bermuda grass Smooth brome (north) Carpet grass (south) Dallis grass (from central Arkansas south) Tall fescue	Dallis grass Italian ryegrass Alyce clover (south) Burclovers Alsike clover (wet lands) Crimson clover Hop, bighop clover Persian clover (south) White, ladino clover Annual lespedezas (except on calcareous soils) Black medic (calcareous) Singletary peas (from central Arkansas south)
Loessial Upland and Terrace—All sites	Bermuda grass Carpet grass (south) Dallis grass (from central Arkansas south). Tall fescue	Alyce clover Dallis grass Italian ryegrass Alsike clover (wet sites) Crimson clover Hop, bighop clover Persian clover (south) White, ladino clover Annual lespedezas Sericea lespedeza Singletary peas (from central Arkansas south) Burclovers
Forested Coastal Plain—Upland sites in 40″ or less rainfall areas	Bermuda grass KR bluestem	Annual lespedezas Sericea lespedezas Singletary peas Vetch

Problem area in soil conservation, and site	Suitable base grasses	Legumes and grasses for overseeding
Forested Coastal Plain—Bottomland sites and upland sites in areas with more than 40″ rainfall, average or better moisture conditions.	Bahia grass (south only) Bermuda grass KR bluestem (flatwoods) Carpet grass (south) Dallis grass Tall fescue	Dallis grass Italian ryegrass Alyce clover Burclovers Crimson clover Hop, bighop clover Persian clover White, ladino clover Annual lespedezas Sericea lespedeza Singletary peas Vetch
Forested Coastal Plain—Coarse, sandier soils sites with less favorable moisture conditions (deep sands better for growing pine or to establish to pure stands of kudzu or sericea lespedeza).	Bermuda grass KR bluestem	Annual lespedezas Sericea lespedeza Singletary peas Vetch
Coast Prairie—Sandy sites.	Bermuda grass Angleton bluestem (west) KR bluestem	Annual lespedezas Singletary peas Sweetclovers (west) Vetch
Coast Prairie—Mixed land sites.	Bahia grass Bermuda grass Angleton bluestem KR bluestem (west) Carpet grass (east)	Annual lespedezas Singletary peas Sweetclovers (west)
Coast Prairie—Tight land sites.	Bermuda grass Angleton bluestem KR bluestem (west) Carpet grass (east) Dallis grass Tall fescue Rhodes grass (west)	Dallis grass Italian ryegrass Crimson clover Persian clover (east) White, ladino clover Annual lespedezas (east) Singletary peas Sweetclovers (west)
Blackland Prairies—Deep, favorable moisture sites (other conditions better in native range).	Bermuda grass KR bluestem Buffalo grass Tall fescue	Dallis grass Rescue grass Burclovers Black medic Sweetclovers Vetch
Grand Prairie—Sites with favorable moisture (other conditions better in native range).	Bermuda grass (best bottomland sites only) KR bluestem Buffalo grass Tall fescue (bottomland)	Burclovers Black medic Sweetclovers Vetch
Rio Grande Plains—Sites with favorable moisture only (other conditions better in native range).	Angleton bluestem (along coast) KR bluestem Rhodes grass	Sweetclovers

ALFALFA, Queen of Forage Crops

(*From page* 14)

competes very strongly with alfalfa the first year and then disappears, leaving much space for seeded or volunteer grasses.

Ladino clover and alfalfa do best under such widely varying cutting or grazing systems and on such different types of soils that it appears unwise to include both in the same seeding.

Without any doubt, alfalfa is the highest yielding hay or "grass" silage crop yet grown in Connecticut. This is true whether the comparisons are based on dry matter or digestible nutrients. When one considers that these high yields may be produced on soils too sandy for other forages, during droughty as well as favorable seasons, for 5 to 10 years without reseeding, and at an annual fertilizer cost of not over $15 per acre, the remarkable fact is the relatively small area now growing alfalfa. In recent years, some Connecticut dairymen have purchased alfalfa hay from other states at more than $50 per ton, while nearby land, capable of growing three tons per acre annually, lies practically idle. In view of this situation, will anyone deny "thar is gold in them hills?"

Kentucky-31 Fescue

(*From page* 19)

Soil Conservation District.

The Jones brothers were so impressed by the new grass that they made a special trip to Kentucky, where they visited "every field of fescue in the State." They got their foundation stock from Pembroke, Ky., where the original planting of the University of Kentucky was made with seed from the B. F. Suiter farm. Two years later, in 1949, the Jones farm produced more than 90 per cent of the certified Kentucky-31 fescue seed grown in Alabama.

"Of course," Col. Jones went on to explain after we had examined the sod where the 400 head had grazed during the winter, "we don't advocate such heavy grazing under ordinary conditions. The fescue in this field was over knee-high when we turned the cows on it on November 13. They stayed right here until March 13. And during that period we had more than 30 inches of rain. But you can see for yourself, the ground's not marked. We fed them some meal and hulls," he added, "but only during extremely cold weather and when the grass had been hit by a heavy frost. We haven't a cow on this farm that has ever been in a barn."

We had seen the herd of 400 brood cows earlier that day grazing on an 80-acre field of fescue that had been planted November 19, 1949, on a two-year-old stand of sericea. They had been there since they came off the winter pasture three weeks before. The weather had been cold for the past few weeks and the sericea had not yet put out new growth, but the fescue was furnishing plenty of green grazing.

The fescue was planted on the sericea at the rate of 20 pounds to the acre with the drill on top of the ground. The land had been disked twice, with most of the angle out of the disk.

In another field of 75 acres, 150 young heifers that had been cut out for brood cows were grazing fescue planted last October in what had been an old pasture that had grown up in weeds. Another herd could be seen grazing in

an adjoining field and a low-lying area nearby was being cleared for planting more land to fescue.

At seeding time, Col. Jones told us, they drill in 300 pounds of 6-8-8 with the seed. About March 1 they add an application of 100 pounds of ammonium nitrate per acre. He said they planned to add an equal amount of ammonium nitrate in the fall if they expected to graze the fescue, and would add potash and phosphate as the soils needed it.

The Jones brothers use 2, 4-D to kill wild onions and other weeds to keep impurities out of the fescue seed. This also kills the clover, but Col. Jones pointed out that they could add clover any time, in fact, it is coming back naturally in some of the fields.

One of the farmers among the group of visitors thought this over for a minute and commented:

"I don't see where you've got room for anything else to grow."

Know Your Soil

(*From page* 18)

oxide increased the yield with the 3-9-6, but larger amounts of magnesium oxide depressed it. The 3-9-12 and 3-9-18 mixtures produced rather constant increases in yield as the magnesium increased. The sweet potatoes were divided into chunky (mostly round), jumbo long and irregular, and seed potatoes.

Figure 2 shows the round and chunky

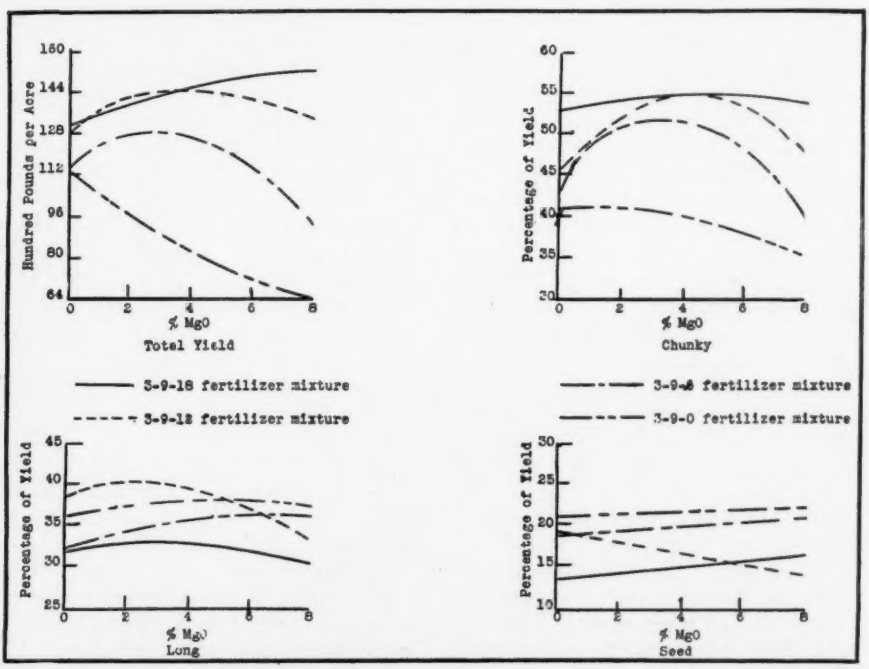


Fig. 1. Influence of different amounts of magnesium in relation to different amounts of potash upon the yield and shape of the Ranger sweet potato.

Fig. 2. The tendency toward chunky Ranger sweet potatoes results from high potash and magnesium. The long potatoes tend to result from high magesium and low potash.

potatoes as compared with the long potatoes. The percentage yield of chunky potatoes remained high with the 3-9-18 fertilizer mixtures throughout the magnesium series. The percentage of the chunky potatoes was increased considerably with the 3-9-12 fertilizer mixture up to 4 per cent magnesium oxide. The percentage yield of chunky potatoes was not increased with the lesser amounts of potash. In general, the percentage yield of the long, irregular shaped potatoes was in reverse to the chunky potatoes. The yield of seed potatoes remained fairly constant.

It appears that a definite relationship exists between the yield of sweet potatoes and potassium application and the available magnesium present, either in the soil or added with the fertilizer mixture. Working with soils of low available magnesium content, the addition of magnesium to the fertilizer mixtures is highly desirable. Two to 4 per cent magnesium oxide is necessary. With the use of magnesium in the fertilizer, growers are now returning to a 3-9-12 and higher potash fertilizer mixtures with successful production. Most of the soils on the Eastern Seaboard that are used for sweet potato production are sandy in nature and low in magnesium. Therefore, for the maximum production of high quality potatoes through the proper use of potash, the magnesium status of the soil is of concern.

Literature

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Pledge to Youth

(*From page* 5)

outer end of the swinging crosspiece. By pushing the other end we moved the sled in whirligig style over the smooth ice. Not only did we have days of rare fun riding the sled in a wide circle, but by deft manipulation of the tie rope we could free the sled from the revolving arm so that it shot out like a gun across the pond.

For the smaller ones he rigged up double barrel staves with a short-sawn log attached for a seat, and they careened down woody hills in sitting fashion and with no more than the normal spills and bruises. For evening hours around the stove, this gentle, obliging neighbor made pastime games of an ancient day—like checker boards and nine-men-morris outfits. He won our hearts and has them still in his keeping as he lies in the grave above the hillside and the pond.

Being a good parent to be proud of in your old age is as much of a life job as anyone with normal ambition can seek. Too many of us overemphasized this part of the pledge to youth: "We will work to lift the standard of living and to improve our economic practices, so that you may have the material basis for a full life."

That goal is worthy all right and highly important, but we have seen otherwise purposeful parents lay it on too thick on the money-getting side. Far too many dads tore into the business routine at such a steady pace that they were too tired or crotchety to relax and enjoy the companionship of the children. Or they imagined it was mother's duty to take active part in the rearing business, as long as she never had to dodge the bill collector. But those of us who found some time, all too short at best, in which to just be a kid again and live over the wonders and enthusiasm common to youth, will never regret it. To us, the mundane earning of a living was merely a means to permit us to finish the real job nature and life had entrusted to us. Thus when all the go-getting days are over, it is happily our lot to feel that in recognizing what our best job was, we have really laid a foundation for success in at least two generations after our own. Your kids with a good start and a sound example will usually follow through with their offspring, using the same old recipe mixed with some new ingredients.

In dwelling thus on the material security phase of the pledge, it must not be forgotten, however, that poverty, eternal financial fretting, and poor, makeshift living accommodations drag down many of the best-intentioned parents in the world. Bad luck, sickness, some turn of fortune's wheel against the wind conspire to frustrate and bedevil the best laid plans for family welfare. It ill behooves us, if we largely escaped the harshest strokes of fate, to preach the doctrine that one should forget the daily bread and the anchor to windward in carefree commingling with the boys and girls.

"We will encourage you always to seek the truth." Now this plank in the pledge needs to be interpreted two ways. When kids are small and their choice of right and wrong or this and that remains narrow and circumscribed, it is relatively simple to insist on knowing what is true and repeating nothing else but. Some youngsters love to stretch the truth and embellish it with their idle fancy. This streak of imagination has to be deftly handled, possibly not too severely punished or curbed.

But just wait until these children grow and develop and begin to see the ways of their elders and observe the vainglory and the nonsense that poses as perfection all about them. Wait until they get to taste some of the pros and cons of scholastic theory, or start to study civics, or begin to read political

speeches and analyze the various vagaries of some deliberative body—maybe your city aldermen or even the United Nations.

Just about that time you and your good old truth medicine are apt to be in for a rugged test. All of which goes back to that fleeting wish of the weary philosopher, "Oh, to be as simple as my days of childish candor!" When we are young we can stick to the truth, but as we get opinionated and faction-minded, we must face the vexing fact: But after all, what *is* truth? I guess even scientists can't agree on that.

I presume that if we might rear a generation of leaders free of guile and prejudice, open-minded, honest-hearted, and devoted to what is best and enduring, then perhaps we could hope for a new set of values to be universally recognized as the one true good. Maybe such a wild yen is pretty fancy thinking under the conditions of the hour.

ALL of which brings us to what is to me the strongest point in the whole pledge adopted at Washington by the friends of youth: "We will provide you with all opportunities possible to develop your own faith in God."

My first hunch in scanning that one is to say, "You can lead a horse to water, but you can't make him drink." By this I mean that you can be an elder, a religious school teacher, or even a mighty potent preacher, and still not be able to induce your offspring to go the glory road themselves — of their own free will and accord. You can't lick good behavior into a child. You yourself are a better inducement than any big stick when it comes to spiritual things.

Delinquency in growing youth is a menace. Yet the juvenile delinquent is not depraved—he is just deprived. Someone somehow has either neglected him or misguided him. You hear many excuses made by parents when some tragedy exposes a family to the misdeeds of a delinquent. For one thing, they will often lay it all to poor health, rickets, malnutrition, dental caries maybe, or weak eyes. A recent accepted survey showed that only one-sixth of the boys taken to a reformatory were victims of poor health. All the rest were robust specimens.

Next you'll see the trouble blamed on mental illnesses. But recent records taken in juvenile courts in Chicago and Boston show that fully seventy per cent were mentally sound and alert. When that excuse slips, everybody falls back on the theory that delinquency is mostly found in poor families. A lot of that got started because they went out and took their statistics by areas. That left the square mile of space in a crowded tenement district with more kids to count noses on than was the case in a rich neighborhood where gardens, lawns, and wide streets prevail. Besides, wealthy kids seldom get stuck into institutions anyhow, and when a rich dad makes good on a misdemeanor it may not be reported to the police record.

You can hunt far and wide for the principal reason for juvenile misbehavior and finally come right back to the lack of spiritual guidance and adjustment. The delinquency committee of the White House Conference said that over thirty-seven per cent of nearly three thousand delinquent children had absolutely no church connections whatever. Only a few boasted any home training in religion or ethics.

One need but to sense the upsurge of spiritual feeling and the final reliance on ethical and moral belief that has characterized our nation during the months of uncertainty. That alone tells us that the source of strength comes from within.

Great plans for organized aid to growing youth marked the final deliberations of the recent conference. Every aspect of home and community life and all its manifold facilities were brought into the picture. People who had studied youth and helped youth to overcome pitfalls and discouragements made splendid recommendations. Such

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meetings have been fruitful in other years and will continue to be.

But there was too much bemoaning the "terrible" time for successful conduct of this potent enterprise. Somehow the delegates got mixed up in their reactions and imagined they were selling some scarce goods which could easily be rationed in wartime. They forgot that they were dealing with American youth—heirs of the best land to grow faith and strength that the world knows today.

What if youth does have to sacrifice some goal for awhile or deny itself some privilege? What if youth does have to learn what a good country is worth in its own terms of duty rather than to read it out of musty books that give faint pictures of old heroes?

I WOULD insist that even as the saints of old found a place in the Bible because they suffered and triumphed, so do modern men learn to bear crosses manfully. Like my favorite monk of an ancient time, Thomas á Kempis, we can follow this course from youth to old age:

"Do what you *are* doing. Loyally work in the vineyard. . . . Write, read, sing, mourn, be silent, pray. Bear crosses manfully. Life eternal is worth all these battles, and greater.

"Peace will come in a day that is known to the Master, and it will not be the day or the night of the age that is, but an everlasting light, an unlimited brightness, a settled peace and a safe rest. . . .

"Not then will you say, who will deliver me from the body of this death; nor cry out, woe is me that my stay is prolonged: for death will be cast headlong down, and health will be unfailing, anxiety unknown, joy a blessedness, fellowship sweet and beautiful."

With so much that is hopeful and refreshing and inspiring in our youth today, it takes no forced good feeling for me to say to you, at this late hour: "Happy New Year and God Bless America!"

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Request bookings from your nearest distributor

The Texan had been launched on a 45-minute eulogy of Texas, the superior fighting qualities of its men, etc., when a New Englander broke in to ask: "Ever hear of Paul Revere?"

"Sure, he's the guy that ran for help," was the quick comeback.

* * *

"Where's the manager?" demanded an irate-looking lady. "I want to return the washing machine I bought."

"What's the matter with it, madame?" inquired the salesman.

"Well, every time I get into it, the paddles knock me off my feet."

* * *

Mistress: "Mandy, I'm delighted to learn you're engaged to be married. When are your nuptials coming off?"

Mandy: "On mah weddin' night, Miz Jones, an' not a minit befo'!"

* * *

"Is it possible for a man to make a fool of himself without knowing it?"

"Not if he has a wife."

* * *

An old sailor sat on his bunk, stripped to the waist. On his chest were tattooed three women. On his back were tattooed three more women. On each arm were tattooed even more women.

There entered a young fellow only just joined up. He glanced at the old tar, and to the latter's disgust, inquired: "Hallo, old man! Been in the Navy long?"

A young couple, very anxious to be married, went to see a local judge. "Impossible," said the judge. "Even a special license would take two days."

The would-be bride and groom exchanged a look of misery, then a smile appeared across the man's face. "Well," he suggested, "couldn't you say a few words just to tide us over the weekend?

* * *

Drunk: "Ho! Lady, you got two ver' beautiful legs."

Girl (snapping): "How would you know?"

Drunk (brightly): "I counted 'em."

* * *

In our public schools today teachers are afraid of the principals; the principals are afraid of the superintendents; the superintendents are afraid of the school boards; the school boards are afraid of the parents; the parents are afraid of the children; and the children are afraid of nobody.

* * *

Displaying her wedding gifts, the bride came to one from the groom's Army buddy. "I just adore these personalized gifts," she said. "We received towels and washcloths with HIS and HERS on them, but," she blushed, "this is even more personal."

And she held up an olive-drab blanket with the letters US stamped in the middle.

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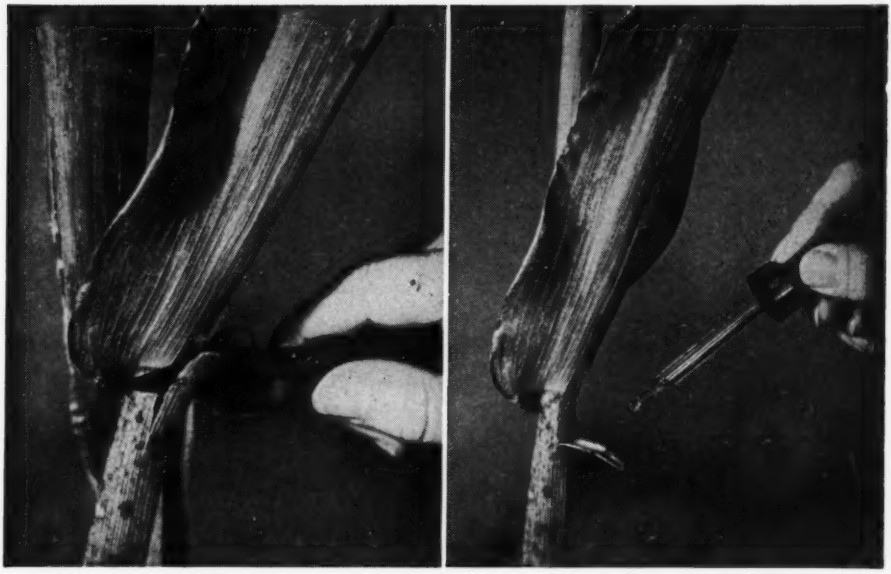

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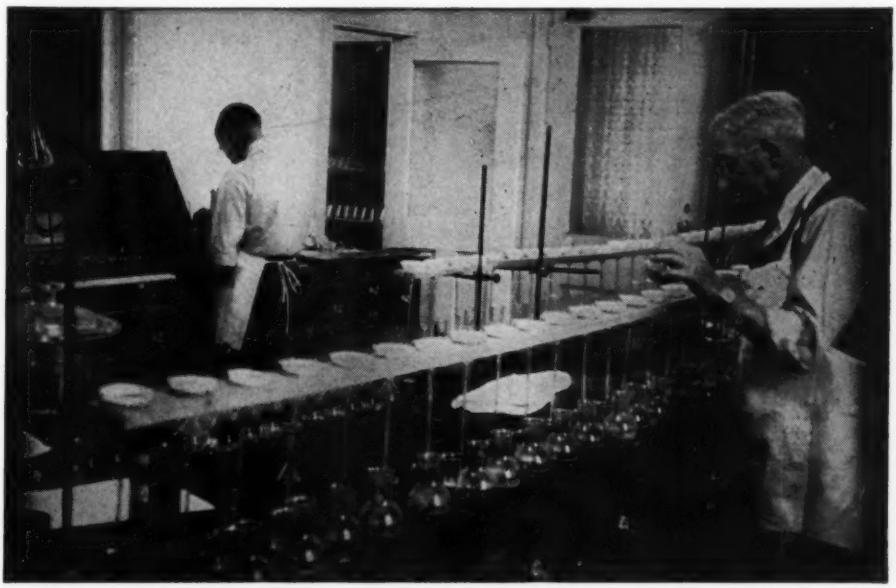

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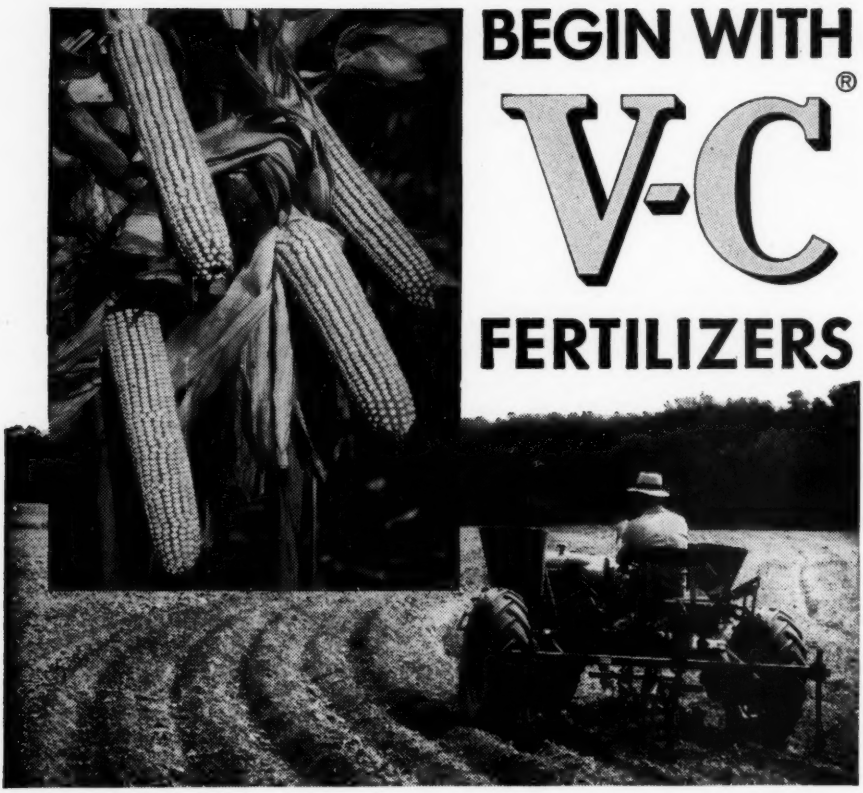

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